

Catalogue
and
Hints on Steel



Halcumb Steel Company

SYRACUSE, N. Y.

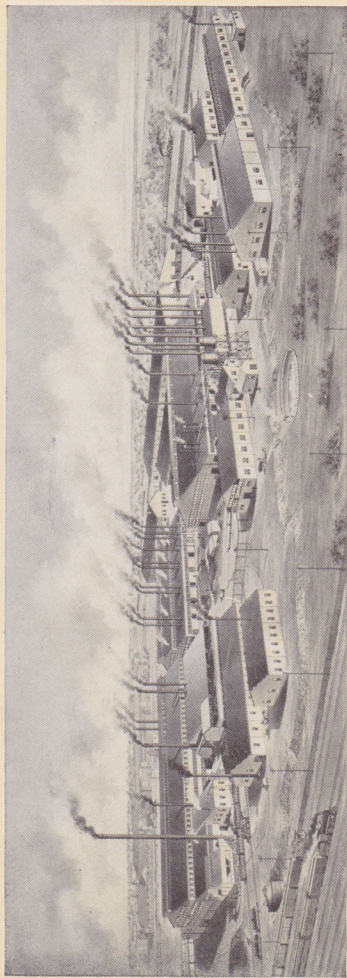




Burgess,
Ithaca,
New,
York.

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By HALCOMB STEEL CO.
Syracuse, N. Y.

Burgess
Ithaca
New York



HALCOMB STEEL COMPANY, SYRACUSE, N. Y.

HALCOMB STEEL COMPANY

MANUFACTURERS OF

HIGHEST GRADE
CRUCIBLE AND ELECTRIC
TOOL AND ALLOY STEELS

IN BARS, SHEETS, STRIPS, DRILL RODS,
WIRE, HOT ROLLED SHAPES, FORGINGS
AND COLD DRAWN SHAPES
TO ACCURATE SIZES



Fourth Revised Edition

CHIEF OFFICE AND WORKS
SYRACUSE, NEW YORK

HALCOMB STEEL COMPANY

H. S. WILKINSON, President
J. A. MATHEWS, General Manager
J. A. DISTIN, Ass't General Manager



The Halcomb Steel Company operates the newest and largest plant in the world devoted exclusively to crucible and electric furnace products of the highest grades. This company is the pioneer in the manufacture of Electric Steel in the United States of America. It specializes broadly in two fields: *First*—In tool and high speed steels; *Second*—In alloy steels for automobile and general engineering purposes.

Branches, Agencies and Stocks

Syracuse, N. Y.	- - - -	Office and Works
Cleveland, Ohio	- - - -	1274 Ontario Street
Chicago, Ill.	- - - -	608 West Adams Street
Philadelphia, Pa.	- - - -	633 Arch Street
New York, N. Y.	- - - -	65 Liberty Street

and

Hawkrigde Bros. Company, 303 Congress Street,
Boston, Mass.

Halcomb Steel Company

Terms

Terms are cash unless otherwise agreed.

Prices

Prices are subject to change without notice.

Sales

Sales and contracts of sale are subject to the provision that strikes and delays from causes beyond our control shall relieve us from prompt fulfillment of orders.

Warranty

We will replace defective steel and steel in first hands found unsuitable under proper usage, where the purpose for which the steel is to be used is stated in the order. Consumers' own shop risks, such as damage, and labor put upon steel, we cannot, of course, assume.

Packing

Boxing and casing, where required, will be charged at cost.

Special Notice

This list and the classifications herein contained replace all previous catalogues.

INTRODUCTORY

THE remarkable development which has recently taken place in the production of certain grades of steel and in their economic use in shop practice, is an illustration of the rapid evolution that is going on in steel-making and in the related mechanic arts.

The uses to which the potent metal—steel—is itself applied are enlarging daily, while the importance of its application to the shaping and preparation of the many other materials of construction can hardly be overestimated.

As the uses and applications multiply, the steel-maker is called upon, not only to provide a greater variety of kinds and qualities than ever before, but he is also expected to meet to almost absolute perfection a host of most exacting requirements.

It is clear that in this is involved great responsibility.

The Halcomb Steel Company is prepared to meet to the present limit of the steel-making art this responsibility and these requirements.

With a management that has already attained the highest measure of success in fine steel production, it brings to the undertaking a plant newly built to take advantage of every approved modern method and appliance, while holding fast to those old and tried methods which have

Halcomb Steel Company

shown their utility and value since the early days of the industry, a century and more ago. And what is of equal importance, the management has secured in every department a full working force of competent, skilled steel-makers and workers — practical men — whose lives have been devoted to the mastery and perfection of this one difficult craft. Supplementing our unsurpassed operating staff, we have a technical staff of chemists, mechanical and metallurgical engineers,—men of ability and experience, careful observers, used to exact methods and scientific accuracy.

With these advantages, and with the further advantage of a carefully selected location on the line of three trunk railway systems and a waterway, affording convenient and economical facilities for handling supplies and product, and with full assurance that American steel consumers will be found alert in recognizing the value of GOOD STEEL, the Halcomb Steel Company operates under the best auspices, making the finest qualities of Tool Steel its principal product. The abundant and ever increasing patronage during the few years since this company was organized, is ample proof that it is already regarded by the trade as the leading source of supply, where high quality and uniform excellence is demanded.

Labels, fac-similes of which are shown in the following pages, will be found upon all our fine grades of steel, and our name and the grade are stamped in the bar.



Halcomb Steel Company

Halcomb Dreadnought High Speed Tool Steel

Our special high speed steel, Dreadnought, is a product worthy of its name,—a defender against foreign intruders. It is the last word in evolution of tool steel metallurgy, the product of America's most skilled workmen in the difficult art of fine steel making and of trained metallurgists of national repute.

It is not surpassed by any steel, domestic or foreign, where severe duty is required, as in heavy lathe, planer, and boring tools, roughing or formed tools for tire turning, alloy steel gear cutters, flat and twisted drills, cold nut punches, rotary shear discs, blanking dies, etc.

Dreadnought and our other High Speed products—"Halcomb High Speed," and "L. C. T. Alloy,"—are noted for persistent uniformity of analysis so sadly lacking in steels of other makes.

Our High Speed Steels do not require fussy treatments and therein lies one of their great advantages. The risk of breaking in hardening is minimized; tools can scarcely be injured

Price, base sizes

Annealing, extra per lb.

The extras for size are double those of the Tool Steel Classification, see page 32.

Halcumb Steel Company

by over-heating. When much machining is to be done, as in making twist-drills, cutters, and threading tools, we furnish the steel annealed very soft for easy cutting.

Cutters and fragile tools, and tools requiring the preservation of a sharp edge, can be hardened below a full sweating heat and will retain an excellent cutting edge and show high efficiency for either roughing or finishing work.

In developing Dreadnought we have employed experts of international reputation. Their prolonged investigations, of unusual thoroughness and accuracy, and the kind co-operation of the largest users of these products, have resulted in its perfection.

The verdict of large users amply justifies all our claims and also justifies the large expense of our investigations.

Dreadnought may be furnished in rounds, squares and flats, blocks and discs; also in profile and beaded sections for twist drills. Potter and Johnson's automatic section (three quarter square with one corner depressed), also in cold drawn rounds and flats. Large stocks of ordinary sizes are carried at our Mill and at all our Branches and Agencies.

Halcomb Steel Company

Halcomb High Speed Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

HALCOMB
HIGH SPEED TOOL STEEL

Price, base sizes
Annealing, extra per lb.

The extras for size are double those of the
Tool Steel Classification, see page 32.

Halcomb High Speed Steel

This steel is recommended for cutting-off tools, threading dies, milling cutters, drills, reamers, burnishing and reshear dies, serrating tools, hot dies, etc. For lathe, planer and slotting it is of superior excellence and may be used in all cases where the equipment, machine tools or class of work being done do not demand the very highest efficiency in the cutting tool. In other cases use Dreadnought. Halcomb High Speed is not by any means a low grade product, it is about equal to any and superior to most high speed steels now on the market, but is not equal, by a wide margin, to our Dreadnought. It is a "specialty" steel, and fills with great satisfaction many requirements where that more expensive product is not warranted.

Halcomb Steel Company

Halcomb "L. C. T." Alloy



HALCOMB STEEL CO.
SYRACUSE, N. Y.

"L. C. T." ALLOY
FOR HOT WORK

Price, base sizes
Annealing, extra per lb.

The extras for size are double those of the
Tool Steel Classification, see page 32.

Halcomb "L. C. T." Alloy

This product, which is of the general nature of high speed steel, is designed to meet those requirements necessitating the combined qualities of "red-hardness" and toughness. It will be found of great value for hot nut punches and cut-off blades, hot shear blades, heading punches and gripper dies, compression dies, etc.

This steel is used with conspicuous success in all hot operations and resists checking, battering and softening even at high heats in such tools as hot swaging dies, spike cutters, crown-ing tools, nut piercers and nut boxes.

In all cases where high speed steel is to be used for hot work, so specify in your order and ask for "L. C. T." Alloy. Tell us the exact purpose and we will recommend the best treatment for the work required.

Halcumb Steel Company

Directions for Working FOR LATHE AND PLANER TOOLS

When first heating, the tool should be heated very slowly to red, after which the tool may be forged at a light red heat. Cool in lime or ashes before reheating for hardening. For hardening, the tool should be heated slowly to bright red, then heated up quickly until the point of the tool appears to be melting and running; then cool off in a cold dry blast. For large sizes, and for moderate sized squares and flats, cool in linseed or fish oil.

These steels can be used on all classes of material; make good finishing cuts, at high speeds. For such use harden at a bright yellow heat, quench in oil, and for finish grinding, a sand-stone wheel is recommended.

HARDENING MILLING CUTTERS, TWIST DRILLS, ETC.

Cutters: Pre-heat slowly to a bright red, place the cutter on a round bar to suit the size of hole, then revolve quickly over a very sharp fire, and give the highest heat possible without spoiling the teeth; then cool off in a cold blast, or in fish oil.

Twist Drills, Taps, Light, Fragile Cutters or Formed Cutters may be heated almost to white heat, and then dipped into fish oil for hardening. This gives excellent results, but the higher heat, air-cooled, is the best method where possible.

Halcomb Steel Company

Treated High Speed Steel FOR TOOL HOLDERS

We supply and carry in stock Standard Tool Holder lengths hardened and ready for use, in five and ten pound boxes, of either single or assorted sizes.

The following sizes and lengths are carried in stock; cut to thirty degree bevel ends.

$\frac{3}{16}$ in.	sq.	$1\frac{1}{2}$ in.	long,	$\frac{1}{2}$ in	sq.	4 in.	long,
$\frac{1}{4}$	" "	2	" "	$\frac{5}{8}$	" "	$4\frac{1}{2}$	" "
$\frac{5}{16}$	" "	$2\frac{1}{2}$	" "	$\frac{3}{4}$	" "	5	" "
$\frac{3}{8}$	" "	3	" "	$\frac{7}{8}$	" "	6	" "
$\frac{7}{16}$	" "	$3\frac{1}{2}$	" "	1	" "	7	" "

Special Lengths and Sizes made to order.

Send for List showing piece prices.

We can also supply rounds, squares, flats, single and double bevels or standard shapes and sizes hardened in short bar lengths and ready for use, after simply nicking and breaking to length and grinding to shape.

NOTES ON HANDLING HIGH SPEED STEEL

For cutting off Lathe Tool lengths from large bars, either cut the steel hot with a Chisel or saw off with a Hack Saw.

Do not be afraid to get High Speed Steel hot for forging. The danger of forging after the heat has fallen too low, is greater than the danger of forging at too high a heat.

The heating should be uniform and penetrate clear to the center of the bar before forging is begun, and frequent reheatings may be necessary for finishing large Tools.

Halcomb Steel Company

Halcomb Air Hardening Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

AIR HARDENING
TOOL STEEL

Base sizes per lb.

Same extras for size as HIGH SPEED Steel.

For boring, slotting, planing and turning at high speeds, it is only surpassed by our HIGH SPEED Steels. Recommended for hard wood knives and hot bolt forging dies. Especially good for roughing and finishing bronze and brass.

Treatment

This steel cannot be cut or punched cold, but can be shaped and ground on a stone or emery wheel.

In Forging — heat slowly and thoroughly to a bright red, and keep as even heat as possible ; do not attempt to work the tool after it becomes a dark red ; give frequent heats if necessary. After the tool is made, heat it again to a bright red, and lay it down to cool in a dry place, or else cool it off in a blast ; water must not touch it when hot.

Halcomb Steel Company

Halcomb Double Special Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

DOUBLE SPECIAL
TOOL STEEL

Base sizes per lb.

The very highest grade of tempering steel. For cutting Tempered Steel, Chilled Iron, etc. Useful for Boring, Rifle Barrel Drills, etc., and is especially valuable for fine finishing cuts. Not intended for tools which have to withstand shocks like the blows of a hammer or sledge. Recommended for drawing dies for brass and copper, and for blanking dies for hard materials, formed cutters for automatics, and for roll turning tools.

Treatment

Being very dense in structure, this steel should be given more time in heating for forging and hardening than other tempering steel.

For forging, heat slowly and uniformly to a bright red; then forge the tool, using light blows as the heat dies out.

Do not hammer at a black heat.

For hardening, re-heat to 1450°-1500° and quench in cold water.

Use a wet grindstone in grinding tools made from this steel.

Halcomb Steel Company

Halcomb Ketos Oil-hardening Non-shrinking Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

**KETOS OIL
HARDENING STEEL**

Base sizes per lb.

Made in one quality and temper only.

KETOS is a steel distinctly in a class by itself, recognized by leading tool steel users throughout the United States as the only reliable NON-SHRINKING Tool Steel ever introduced.

For all tools demanding keen, durable cutting edge, such as Taps, Reamers, Broaches, Blanking, Trimming, Punching, Forming and Threading Dies, Milling Cutters, Circular Cutters, and tools for turning and finishing brass, Master Tools, and Gauges of every description, in fact in all tools where toughness, non-shrinking, non-warping and safety in hardening are first considerations, KETOS is unequalled.

We do not claim that all tools made of KETOS Steel will neither expand, contract, or change shape in hardening, for we recognize what every tool hardener knows, that much must be left to

Halcomb Steel Company



the experience and judgment of the operator with given hardening facilities, which circumstances are beyond our control. We do maintain, however, that with observance of good practice, tools requiring the utmost degree of accuracy are hardened without movement in either size or shape ; moreover, that no other tool on the market responds so satisfactorily to good heating, or shows the effect of skillful handling as well as KETOS.

Factors in Heating, Hardening and Tempering

KETOS Steel is always furnished annealed. You can hardly heat KETOS too slowly.

By whatever means this steel is heated, ample time should be devoted to slow pre-heating. Heat does not penetrate KETOS Steel as rapidly as ordinary carbon tool steel.

Best results with KETOS Steel can be expected when the heating is done in oil or gas muffle furnaces, where the tools do not come in contact with flame.

Let the heating be done gradually and uniformly, until the tools show a dark red heat throughout, say 1100° to 1200° Fahr., before raising the heating to hardening point. The greater the care devoted to rational heating, the better the results will be. Satisfactory results have in general been obtained between

Halcomb Steel Company

1360° and 1425° Fahr. (dark cherry red heat), depending upon cross section, size and shape of piece being hardened; small sections and sizes take the lower heats.



KETOS Steel is essentially an oil-hardening steel—fish oil preferred—but any light tempering oil, such as linseed, lard, or cottonseed is suitable. Avoid heavy fatty, or mineral oils. The bath should be of ample size and a temperature as uniform and moderate as possible should be maintained. All tools should be left in the oil bath until thoroughly cold.

Draw the temper slowly — In taps, reamers, and cutting tools, the temper is drawn to very faint yellow, merely enough to relieve the strain, viz. 250° to 270° Fahr.; in blanking and stamping dies, and all tools where toughness is required, draw the temper to 450° to 460° Fahr.

When properly hardened, KETOS fracture presents a fine velvety grain.

Special KETOS Booklet furnished on application.

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Halcomb Special Tool Steel



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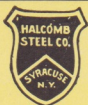
SPECIAL TOOL STEEL

Base sizes per lb.

This steel is made in all tempers. (See Temper List, pages 25 and 26.)

For turning, planing and slotting hard materials; for expensive Cutters, Drills, Forming Tools, Taps, Reamers, Punches, Dies, etc., and is particularly recommended for all kinds of tools where special endurance is sought, and where great strength and toughness are required.

Halcomb Extra Special Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

**EXTRA SPECIAL
TOOL STEEL**

Base sizes per lb.

This steel is made in all tempers. (See Temper List, pages 25 and 26.)

For general use where a better grade than the Extra is desirable, together with deep hardening qualities.

Halcomb Steel Company

Halcomb Extra Warranted Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

**EXTRA WARRANTED
TOOL STEEL**

Base sizes per lb.

This steel is made in all tempers. (See Temper List, pages 25 and 26.)

A steel of extra fine quality, useful for many kinds of tools, including Wood-working Bits and Knives, Cold Chisels, Drills, Mining Drills, Granite Tools, Lathe and Planer Tools, Cutters, Taps, Reamers, Dies, Shear Blades, Punches, etc. An excellent steel for general use.

Halcomb Standard Tool Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

STANDARD TOOL STEEL

Base sizes per lb.

This steel is made in all tempers. (See Temper List, pages 25 and 26.)

A standard grade for all ordinary purposes, including Rock and Mining Drills, Quarry Tools, Hammers and Chisels, Smiths' Tools, Swages, Track Tools, Rivet Sets, Boiler-makers' Tools, Plumbers' Taps, etc.

Halcomb Steel Company

Magnet Steel



HALCOMB STEEL CO.
SYRACUSE, N. Y.

SPECIAL
MAGNET STEEL

Base sizes per lb.

We have probably made the most exhaustive investigations ever undertaken upon the nature, heat treatment and manufacture of permanent magnet steel. Our product has never been surpassed, magnetically, nor even approached for uniformity by any domestic or foreign permanent magnet steel. Makers of switchboard instruments, watt-meters, magnetos and telephones, who require the highest residual strength and permanence that can be had, and uniformity from time to time, use our steel exclusively.

Drawing Die (Wortle) Steel

Base sizes per lb.

These steels are made in several grades, each having its special use. We have made a special study of steels for wire drawing purposes. Let us know the kind of work being done:—whether breaking down or finishing, large or small sizes, rounds or shapes, low or high carbon, steel or copper, and we will furnish a wortle adapted to your particular needs.

Furnished in bars or plates, unpierced.

Halcumb Steel Company

Miscellaneous Brands of Tool Steel

In addition to the standard brands just described we manufacture several special grades to meet unusual requirements. These, in general, are not carried in stock, but can be supplied promptly on order.

Hack Saw Steel

Furnished primarily in sheets for hack saws and slotting saws, but also a valuable steel in bars for high grade taps, drills, threading tools, etc. An alloy steel intermediate in character between Extra Warranted and Double Special.

Chrome Vanadium Tool Steel

In several types for use when tools must stand vibration and shock. Especially adapted for severe duty in punching, hot and cold upsetting, etc.

Our TYPE-H Steel has given extraordinary results when oil-hardened for Jewelers' or Silversmiths' Dies, Punches, Plungers, etc., where hard surface, extra wearing qualities, toughness and shock resistance are needed.

Crucible Cast Steel

Is a low grade steel, but is a genuine crucible product. We do not make or sell so-called "crucible analysis" steel made in the open-hearth furnace. For uses where a high priced steel is not justified.

Halcomb Steel Company

Particular Notice

We would call the special attention of the users of Tool Steel to the importance of studying its different tempers with relation to the various purposes for which it is required.

TEMPER means percentage of carbon combined with iron to produce Steel, and has no relation to price.

THE QUALITY of Steel means the absence of phosphorus, sulphur and other impurities, and can only be secured by the selection of the purest ores, which are costly in proportion to their purity.

For the convenience of our customers *every bar* of our steel is stamped in the center with a number corresponding to the number given on the following pages.

The lowest number is the Mildest Steel, the percentage of carbon increasing as the numbers advance.

(These numbers are more or less arbitrary, and we sometimes make a little variation where the conditions are well known to us, and seem to call for some modification. Thus either 4 or $4\frac{1}{2}$ will make a good cold chisel, and a cutter die can be made from either $4\frac{1}{2}$, 5 or $5\frac{1}{2}$; but No. 6 would be entirely unsatisfactory for a sledge hammer; and No. $2\frac{1}{2}$ would not do for a lathe or planer tool.)

It is most important when ordering steel to state the purpose for which the steel will be used.

Temper Numbers

6 Used for Tools for working Chilled Castings, Wheel Tires, Lathe and Planer Tools, Razors, and generally for tools intended for hard materials. Forging should be done at bright red heat. Welding can scarcely be done. Hardening to be done at dark red heat, and should be done with the utmost care.

5¹/₂ Used for Small Drills, Taps, Dies, Cutters, Boring Tools, etc. Forging should be done at bright red heat. Welding must be done with borax and with the greatest care. Hardening at dull red heat. Must be carefully treated.

5 Used for Drills, Taps, Reamers, Milling Cutters, Circular Cutters, Cutting and Trimming Dies, Mill Picks, Graving Tools, Twist Drills, etc. Forging should be done at bright red heat. Welding with borax; with precaution. Hardening at dull red heat.

4¹/₂ Used for Screw Cutting Dies, large Cutting and Trimming Dies, Small Punches, Small Hand Chisels, Large Milling Cutters, Cups, Cones, etc. Forging should be done at light red heat. Welding is best done with borax. Hardening at bright red heat.

Temper Numbers

4 Used for Hand Chisels, Punches, Punch Dies, Small Shear Blades, etc., and generally when a hard surface combined with tenacity is required. Forging should be done at light red heat. Welding is best done with borax. Hardening at bright red heat.

$3\frac{1}{2}$ Used for Large Hand Chisels, Large Punches, Shear Blades, and Dies, and in general for Tools requiring a hard surface combined with great tenacity; for steeling of larger surface. Forging should be done at light red heat. Welding is easily done with sand and borax. Hardening at bright red heat.

3 Used for Drop Forging Dies, Hammers, Cold Sets, Track Chisels, Smiths' Tools, Well Drills, etc. Forging should be done at light red heat. Welds readily. Hardening at light red heat.

$2\frac{1}{2}$ Used for Snaps, Rivet Sets, Cupping Tools, etc. Forging should be done at light red heat. Welding can very easily be done. Hardening at light red heat.

Annealing

Per lb.

Annealing HIGH SPEED Tool Steel	
Annealing Tool Steel	

For taps, reamers and toothed tools, the best practice calls for only moderately soft annealing, for where too soft it is difficult to cut a smooth thread. Our regular annealing is most suitable for general work, such as making Taps, Dies, Reamers, etc.

We are prepared, however, to furnish steel either *half-annealed*, *annealed* or *soft-annealed*, as desired.

The annealing process has for its object, not only to soften steel, in order that it may be worked readily, but also to take out strains that are put in by hammers or rolls or at the smiths' forge, and the operation requires care and good judgment.


The tool-maker should bear in mind that too high heat, as well as too prolonged heat, will produce a harsh, coarse grain, and increase the liability to crack in hardening, while the toughness and strength of the steel will be greatly and permanently impaired.

To anneal properly, steel should be heated uniformly without coming into direct contact with the fire. Our heating for annealing is all done in this manner, and does not exceed 1450° Fahr. The steel-maker is supposed to have the facilities for this kind of work, and should also, on account of his knowledge of the nature of the material, be best qualified to obtain the best results.

Believing in the importance of the operation, we have equipped our Works with best appliances for doing it, and we strongly recommend that where possible it be left to us.

Harcourt Steel Company

Heat Colors

NAMES	COLOR SCALE	CENT.	FAHR.
11 White		1204°	2200°
10 Light Yellow		1079°	1975°
9 Lemon		996°	1825°
8 Orange		941°	1725°
7 Salmon		899°	1650°
6 Bright Red		843°	1550°
5 Cherry or Full Red		746°	1375°
4 Medium Cherry		677°	1250°
3 Dark Cherry		635°	1175°
2 Blood Red		566°	1050°
1 Faint Red		482°	900°

NOTE—The above is a graphic suggestion of the relation between heat colors and temperatures. Such a scheme can be **only approximately** correct.

Halcomb Steel Company

Rules for the Proper Treatment of Halcomb Tool Steel

Selection of the Steel

Select carefully the proper kind of steel required for the purpose in question. A good choice saves time and money.

Ask for information and advice from us, mentioning the purpose for which the steel is intended, in case you should feel uncertain.

Heating and Forging

Do not heat the steel to a higher degree than fixed in the description of each class.

Let the forging begin immediately the proper heat is obtained. Continue the hammering vigorously and constantly, and by gentler strokes toward the finish, until the steel has become only a faint brown heat.

Never heat the steel to more than a faint red heat without forging immediately afterwards.

Welding

Never weld the steel in any other cases than when steel is required to be welded on steel, or steel on iron.

See that the welding heat does not get so strong as to make the steel sparkle, for it is then burnt.

Halcomb Steel Company

Forge as soon as the welds are put together and do it by gentle strokes at first, and gradually harder ; extend the hammering even to other parts than the proper welding point, and do not let the forging cease before the steel is brown hot.

Hardening

Always re-heat the piece of steel after forging for hardening.

Never begin hardening at the same heat at which the forging has been finished.

Let the heating for hardening be as uniform as possible, and it should not be more than the degree fixed for each separate class.

Remember that overheating does not augment the hardness to any degree, but increases brittleness. It is better to risk a failure by giving too low a heat for hardening, as in one case you can re-harden, and in the other you may have spoilt the steel.

Never forget to anneal before hardening such steel which is in want of it. Use a sufficient quantity of hardening fluid.

See that, if the liquid is water, it is pure and has a temperature of 60° to 70° Fahr.

For oil tempering use a fish or linseed oil ; avoid fatty oils.

Keep the liquid or the tool in motion during the hardening.

Avoid a sharp limit between the hardened and unhardened parts of the steel. The hardening temperature or the degree of heat at which

Harcourt Steel Company

the steel by subsequent cooling attains the most suitable hardness and tenacity is somewhat lower than the one at which the steel is forged, or about 1400° to 1500° Fahr.

In general it may be said that the hardening temperature lies between 1400° and 1500° Fahr. It must always be proportioned according to the percentage of carbon in the steel, but other ingredients must also be taken into consideration when they occur in considerable quantity. Thus a steel containing a good percentage of Manganese, Silicon or Tungsten must be hardened at a lower temperature than would have been required for its contents of carbon alone. Thus it may be said that the above named ingredients increase the disposition of the steel for hardening.

Tempering

Choose the manner of tempering most suitable for the purpose.

Choose for the purpose the suitable tempering color. Remember that the tempering increases elasticity and strength, and reduces brittleness.

Consider that it is safer to select a too hard steel, and temper it strongly, than to select a too soft steel with a view of increasing its hardness by a weaker tempering.

For many purposes it is well to temper in an oil bath, where perfectly definite temperatures may be maintained, rather than to rely upon temper colors judged by the eye.

Harcourt Steel Company

Tool Steel Classification

(All dimensions inclusive)

ROUND, SQUARE AND OCTAGON

$\frac{5}{8}$ to 2 ins. diameter ----- Base

Extra, per lb., cents	Extra, per lb., cents
$2\frac{1}{8}$ to 3 ins. ----- 1.0	$\frac{9}{16}$ to $\frac{1}{2}$ in. ----- 0.5
$3\frac{1}{8}$ to 4 ins. ----- 1.5	$\frac{7}{16}$ to $\frac{3}{8}$ in. ----- 1.0
$4\frac{1}{8}$ to 5 ins. ----- 2.0	$\frac{5}{16}$ to $\frac{11}{32}$ in. ----- 2.0
$5\frac{1}{8}$ to 6 ins. ----- 2.5	$\frac{1}{4}$ to $\frac{9}{32}$ in. ----- 3.0
$6\frac{1}{8}$ to 7 ins. ----- 3.0	$\frac{3}{16}$ in. ----- 5.0
$7\frac{1}{8}$ to 8 ins. ----- 3.5	$\frac{5}{32}$ in. ----- 10.0
	$\frac{1}{8}$ in. ----- 18.0

FLAT

$\frac{5}{8}$ to 2 ins. thick by $\frac{9}{16}$ to 2 ins. wide ----- Base

Extra, per lb., cents	Extra, per lb., cents
$\frac{1}{8}$ x $\frac{3}{16}$ ----- 20.0	$\frac{5}{16}$ x $\frac{3}{8}$ to $\frac{5}{8}$ ----- 1.5
$\frac{1}{8}$ x $\frac{1}{4}$ ----- 15.0	$\frac{5}{16}$ x $\frac{11}{16}$ to 8 ----- 1.0
$\frac{1}{8}$ x $\frac{5}{16}$ ----- 8.0	$\frac{3}{8}$ x $\frac{7}{16}$ to 8 ----- 1.0
$\frac{1}{8}$ x $\frac{3}{8}$ ----- 4.0	$\frac{7}{16}$ x $\frac{1}{2}$ to 8 ----- 1.0
$\frac{1}{8}$ x $\frac{7}{16}$ to $\frac{1}{2}$ ----- 3.0	$\frac{1}{2}$ x $\frac{9}{16}$ to 8 ----- 1.0
$\frac{1}{8}$ x $\frac{9}{16}$ to 7 ----- 2.0	$\frac{9}{16}$ x $2\frac{1}{8}$ to 8 ----- 1.0
$\frac{1}{8}$ x $7\frac{1}{8}$ to 8 ----- 3.0	$\frac{9}{16}$ to 2 x $\frac{5}{8}$ to 2 ----- 0.0
$\frac{3}{16}$ x $\frac{1}{4}$ ----- 5.0	$\frac{5}{8}$ to 2 x $2\frac{1}{8}$ to 7 ----- 1.0
$\frac{3}{16}$ x $\frac{5}{16}$ ----- 4.0	$\frac{5}{8}$ to $1\frac{3}{4}$ x $7\frac{1}{8}$ to 8 ----- 1.0
$\frac{3}{16}$ x $\frac{3}{8}$ ----- 3.0	$1\frac{7}{8}$ to 2 x $7\frac{1}{8}$ to 8 ----- 1.5
$\frac{3}{16}$ x $\frac{7}{16}$ to $\frac{5}{8}$ ----- 2.0	$2\frac{1}{8}$ to 3 x $2\frac{1}{8}$ to 5 ----- 1.0
$\frac{3}{16}$ x $\frac{11}{16}$ to 2 ----- 1.5	$2\frac{1}{8}$ to 3 x $5\frac{1}{8}$ to 8 ----- 1.5
$\frac{3}{16}$ x $2\frac{1}{8}$ to 7 ----- 1.0	$3\frac{1}{8}$ to 4 x $3\frac{1}{8}$ to 6 ----- 1.5
$\frac{3}{16}$ x $7\frac{1}{8}$ to 8 ----- 2.0	$3\frac{1}{8}$ to 4 x $6\frac{1}{8}$ to 8 ----- 2.0
$\frac{1}{4}$ x $\frac{5}{16}$ to $\frac{3}{8}$ ----- 2.0	$4\frac{1}{8}$ to 5 x $4\frac{1}{8}$ to 7 ----- 2.0
$\frac{1}{4}$ x $\frac{7}{16}$ to $\frac{5}{8}$ ----- 1.5	$4\frac{1}{8}$ to 5 x $7\frac{1}{8}$ to 8 ----- 2.5
$\frac{1}{4}$ x $\frac{11}{16}$ to 2 ----- 1.5	$5\frac{1}{8}$ to 6 x $5\frac{1}{8}$ to 8 ----- 2.5
$\frac{1}{4}$ x $2\frac{1}{8}$ to 7 ----- 1.0	$6\frac{1}{8}$ to 7 x $6\frac{1}{8}$ to 7 ----- 3.0
$\frac{1}{4}$ x $7\frac{1}{8}$ to 8 ----- 2.0	$6\frac{1}{8}$ to 8 x $7\frac{1}{8}$ to 8 ----- 3.5

Intermediate sizes take the next higher price.

Halconb Steel Company

Cutting to Specified Single and Multiple Lengths

Per lb., cents		Per lb., cents	
24 inches or over	0.5	12 to 18 inches	1.5
18 to 24 inches	1.0	6 to 12 inches	2.0
Less than six inches, special price.			

Over 12 and under 16 feet	1/2 cent	per lb. extra
Over 16 feet	1 cent	per lb. extra
Annealing Carbon Steel	1 cent	per lb. extra
Hexagons, hammered	2 cents	per lb. extra

Crucible Machinery Steel

IN BARS

Base sizes per lb.

ROUND AND SQUARE

3/4-inch to 3 inches Base

Cents extra, per lb.

1/2 to 1 1/16	0.3
3/8 to 1 1/8	0.5
5/16 to 1 3/8	1.0
1/4 and 9/32	1.5
3/16	3.0
3 1/8 to 4	1.0
4 1/8 to 6	1.5
6 1/8 to 7	2.0

FLAT

5/8-inch to 2 inches wide by 9/16-inch
to 2 inches thick Base

The extras for Flat are one-half those of the
Flat Tool Steel Classification on page 32.

Dimensions inclusive.

Intermediate sizes take the next higher price.

Cutting to specified single and multiple
lengths, 24 inches or over, 1/2 cent per lb.;
shorter than 24 inches, according to agreement.

Halcomb Steel Company

Spring Steel Classification

FLAT

1 $\frac{1}{4}$ -inch to 4 inches x No. 4 gauge
to $\frac{1}{2}$ -inch, inclusive . . . Base

Cents extra, per lb.

1 and $1\frac{1}{8}$ inches x No. 1 gauge to No. 4
gauge ----- 0.2

1 to 3 inches x No. 5 gauge to No. 7
gauge ----- 0.5

$\frac{3}{4}$ and $1\frac{5}{8}$ -inch x No. 1 to No. 7 gauge_ 0.5

$\frac{3}{8}$ to $1\frac{1}{8}$ -inch x No. 1 to No. 7 gauge_ 1.0

$\frac{3}{4}$ to 3 ins. x No. 8 to No. 10 gauge_ 1.0

$\frac{3}{4}$ to 3 ins. x No. 11 to No. 16 gauge_ 1.5

$\frac{3}{4}$ to 3 ins. x No. 17 to No. 19 gauge_ 2.2

$\frac{3}{8}$ to $\frac{5}{8}$ -inch x No. 10 to No. 16 gauge_ 4.0

$\frac{3}{8}$ to $\frac{5}{8}$ -inch x No. 17 to No. 19 gauge_ 5.0

For gauges thinner than No. 19, refer to
Sheet List.

ROUND AND SQUARE

$\frac{5}{8}$ to $1\frac{1}{2}$ inches, inclusive . . . Base

Cents extra, per lb.

$\frac{9}{16}$ and $\frac{1}{2}$ -inch ----- 0.2

$\frac{7}{16}$ and $\frac{3}{8}$ -inch ----- 0.5

$\frac{5}{16}$ -inch ----- 1.0

$\frac{1}{4}$ -inch ----- 1.5

$\frac{3}{16}$ -inch ----- 3.0

Cutting to lengths, 24 inches and over, $\frac{2}{10}$
cent per lb.; under 24 inches, special price.

Halcomb Steel Company

Forged Die Blocks

Base, per lb.

Halcomb Ketos . . . . .	.....
Halcomb Special . . . . .	.....
Halcomb Extra Warranted . . . . .	.....
Halcomb Standard . . . . .	.....

By careful selection of quality and temper suitable to the purpose, together with the special forging and annealing given, we are producing Die Blocks for Stamping, Embossing, Trimming and Piercing, which are found exceptionally desirable by silversmiths and others.

These Die Blocks are supplied in Ketos, Special, Extra Warranted and Standard grades of Die Steel, but where the intended product of the die is very large, or the work extremely difficult, or the die intricate, we recommend Ketos or Special grade.

Die Block Forging Extras

The following extras cover the cost of forging and are to be added to the base price of the grade of steel from which the Die Blocks are made :

1 to 2 lbs. weight	12 cents per lb. extra
2 to 3 lbs. weight	11 cents per lb. extra
3 to 5 lbs. weight	9 cents per lb. extra
5 to 7½ lbs. weight	8 cents per lb. extra
7½ to 10 lbs. weight	7 cents per lb. extra
10 to 15 lbs. weight	5 cents per lb. extra
15 to 25 lbs. weight	3 cents per lb. extra
Above 25 lbs. weight	2 cents per lb. extra
Under 1 lb., special price.	
Annealing	1 cent per lb. extra

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Halcomb Steel Company

Forging Extras for Disc and Cutter Blanks

Under 1 lb.	15 cents per lb. extra
1 to 2 lbs.	12 cents per lb. extra
2 to 3 lbs.	11 cents per lb. extra
3 to 4 lbs.	10 cents per lb. extra
4 to 5 lbs.	9 cents per lb. extra
5 to 7½ lbs.	8 cents per lb. extra
7½ to 10 lbs.	7 cents per lb. extra
10 to 15 lbs.	6 cents per lb. extra
15 to 20 lbs.	5 cents per lb. extra
20 to 25 lbs.	4 cents per lb. extra
25 lbs. and over	3 cents per lb. extra

Minimum charge for any Forged Disc, twenty-five cents.

Annealing—one cent per lb. extra.

Above extras apply to Discs not less than one-half inch in thickness; thinner Discs at special rates.

The extras shown in the above table apply to our Extra, Extra Special, Special and Ketos brands.

Self-Hardening and High Speed Discs, double extras for forging and annealing.

Double Special, one and one-half extras for forging and annealing.

To find the cost of any disc, multiply its weight by base price per pound for the quality desired, plus the forging extras per pound, plus the annealing extra per pound.

Halcomb Steel Company

Cutlery Steel Classification

FLAT

1 $\frac{1}{4}$ to 2 $\frac{1}{2}$ ins. wide x 16 gauge and heavier Base

Cents extra, per lb.

1 $\frac{1}{4}$ to 2 $\frac{1}{2}$ ins. wide x 17 to 19 gauge, inclusive ----- 1.0

$\frac{3}{4}$ to 1 $\frac{3}{16}$ ins. wide x 16 gauge and heavier ----- 0.5

$\frac{3}{4}$ to 1 $\frac{3}{16}$ ins. wide x 17 to 19 gauge, inclusive ----- 1.5

$\frac{1}{2}$ to $\frac{11}{16}$ ins. wide x $\frac{3}{16}$ -inch and heavier ----- 0.5

$\frac{1}{2}$ to $\frac{11}{16}$ ins. wide x $\frac{5}{32}$ -inch to 16 gauge, inclusive ----- 1.0

$\frac{3}{8}$ to $\frac{15}{32}$ ins. wide x $\frac{3}{16}$ -inch and heavier ----- 1.0

ROUND AND SQUARE

$\frac{3}{8}$ to $\frac{3}{4}$ -inch, inclusive Base

Cents extra, per lb.

$\frac{11}{32}$ to $\frac{23}{64}$ -inch ----- 0.5

$\frac{5}{16}$ -inch ----- 1.0

$\frac{1}{4}$ and $\frac{9}{32}$ -inch ----- 2.0

BEVELED

2 to 2 $\frac{1}{2}$ ins. wide x 16 gauge and heavier ----- 0.75

2 to 2 $\frac{1}{2}$ inches wide x 18 gauge ----- 1.0

1 $\frac{3}{4}$ and 1 $\frac{7}{8}$ inches wide x 16 gauge and heavier ----- 1.5

Halcomb Steel Company

Hot Rolled Sheet Steel

For Cutters, Pocket Knives, Saws, Slotting Saws, Plane Bits, Scissors and Shears, Knife, Ice-Plow, Hack Saw, Gun and other Springs, and many General Purposes.

Base, per lb.

Halcomb Special	.	.	.	.	.	.	.....
Halcomb Hack Saw	.	.	.	.	.	.	.....
Halcomb Extra Warranted	.	.	.	.	.	.	.....
Halcomb Standard	.	.	.	.	.	.	.....
Second Quality	.	.	.	.	.	.	.....
Third Quality	.	.	.	.	.	.	.....

Nos. 10 to 21 wire gauge, base.

Extras for Lighter Gauges

22	23	24	25	26	27	28	29	30	Nos. W. G.
1	2	3	4	5	6	7	10	15	cents per lb.

Sheets are ordinarily from 16 to 18 inches wide and from 4 to 7 feet long.

Our Sheet Steel is furnished in desired tempering qualities; floor annealed, pack annealed, or roll-gloss finish, as required.

When sheets or strips are ordered by gauge number we follow the Birmingham Gauge, shown on page 68. It is better to specify thickness in thousandths of an inch.

Halcomb Steel Company

Edge Tools

Under this heading we class all kinds of knife, razor and cutlery steels. These are of the best qualities and are furnished in appropriate tempers for every use.

Pocket Blade Steel

This grade hardens and scales well, is tough and strong in the blade and takes a fine polish.

Razor Steel

This is furnished in our Special Tool and Extra Warranted grades, in squares, flats and beveled sizes. Our razor steels will be found to work kindly and harden keenly.

Surgical Instrument Steel

For surgical knives, fine cutlery, dental tools, etc. Furnished in Special Tool, Extra Special and Extra Warranted grades.

Sword and Bayonet Steel

A high quality of oil-tempering steel that has been used extensively by the American Armies for swords, bayonets and hospital corps knives.

Halcomb Steel Company

Edge Tools

Shear Knife Steel

We make a specialty of shear blade and knife steels for both cold and hot work. These are furnished in our Special Tool, Extra Warranted or Standard grades, suitable for Tobacco, Paper and Machine Knife requirements. Furnished suitable for welding when desired.

Axe and Hatchet Steel

In overcoat or plain shapes, beveled and beaded hatchet shapes.

Bit Steels

Plane-iron edge steel, wood bit and auger steel, for either oil or water tempering.

Rolled Shapes

We are prepared to furnish a wide variety of steels for edge-tools in flats, rounds, single and double bevels, and to special shapes for Augers, Cutlery, Paper Knives, Leather Knives, Slate Knives, Welded Knives, Axes, Mattocks Lawn Mowers, etc.

Halcomb Steel Company

Cold Rolling Rolls and Jewelers' Roll Forgings

Per lb.

Halcomb Special . . . . .	.....
Halcomb Special, with journals	.....
Halcomb Extra Special . . . . .	.....
Halcomb Extra Special, with journals . . . . .	.....

We furnish these forgings annealed, ready to make up. Ample allowance in all cases should be made for taking off the annealed surface.

Fine Steel Forgings TO PATTERN OR SKETCH

We are prepared to furnish rough-forged, annealed blanks to pattern or sketch for various purposes, such as Shear Blades, Angle Knives, Cold Heading Dies, Minting Dies, Envelope and Leather Cutting Dies, Cork Cutting Dies, etc., at prices based upon the quality, shape and weight. Prices on application.

Forged Shafts

Rough-forged, also rough turned and annealed, or oil-tempered and annealed. For Electric and High-Speed work. Also Piston Rods, Crank Pins, Hydraulic Rams, Plungers, Axles and Propeller Shafts, etc., to chemical and physical requirements. Ring and Die Forgings. Prices on specifications.

Halcomb Steel Company

Wire Nail Die Shapes

Per lb.

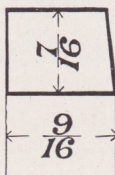
We supply all the standard shapes and sizes for Wire Nail Machine Dies and Cutters, of single and double bevels, all annealed.

The bevels are 10°.

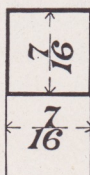
We also supply all square and flat sizes.



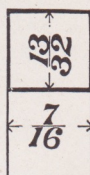
DOUBLE
BEVEL



SINGLE
BEVEL



SQUARE



FLAT

Roll Turning Steel

Per lb.

Halcomb Double Special

We also furnish Roll Turners' Tools, shaped and hardened, at \$1.00 per lb.

Welding and Facing Steel

Halcomb Extra Warranted, for laid
or plated Knives and Dies

Halcomb Standard, for laid Knives
and Dies

Anvil Face

Vice Jaw

Halcomb Steel Company

Cone and Bearing Steels

We produce several grades of steel for cone and annular bearings.

Cone Steel is a high grade carbon steel, hardened at a medium low heat. Especially well annealed for automatics.

Special Bearing Steel for high grade annular bearings. Tempers in oil. An alloy steel very tough after hardening.

Ketos Oil Hardening Steel is recommended in constructions where trouble is experienced in warping or cracking.

Ball Steel

We produce large quantities of steel for balls—cold drawn or hot rolled steel, in carbon or alloy, in best possible conditions for the turned, cold upset, hot forged or hot rolled processes. The leading makers use our steels.

Roller Bearings

Our **ELECTRIC NICKEL** Steel is especially well adapted for case carbonized rollers and cones, where intense surface hardness combined with toughness and freedom from spalling, pitting and roughing up are essential.

Notes

Halcomb Steel Company

Track Chisel Steel

Per lb.

Halcomb Special Vanadium .. .	.....
Halcomb Extra Warranted . . .	.....
Halcomb Standard . . . . .	.....

Roadmasters well know the value of good Track Tools, and are urging the purchase of the *best steel* for that important tool, the Track Chisel, when made in the railroad's own shops. We recommend the three grades listed, all being steels of endurance.

Bush or Patent Hammer Steel

Per lb.

Halcomb Extra Warranted . . .	.....
Halcomb Standard . . . . .	.....

In Sheets and Strips; Gauges Nos. 3 to 18; standard width, 3 inches.

For cutting Granite and other stone.

Mining Drill Steel

Per lb.

Halcomb Extra Warranted . . .	.....
Halcomb Standard . . . . .	.....
Halcomb Extra Drill Steel . . .	.....

We supply Mining Drill Steel in all approved shapes — Octagons, Quarter-Octagons, Hexagons, Fluted Cruciform and Four-leaf Clover, Rounds, Flats, etc.— for Machine Drills, Channellers, Hand Drills, Jumpers, etc. This steel

Halcomb Steel Company

is commended for its uniformity and staying qualities. It works kindly, welds readily, hardens well in the bit, and does not spall off in hand work on the head. Blue prints of special shapes will be sent on application.

Weight of Grooved Mining Drill Steel

ROCKY MOUNTAIN PATTERN

Size	Weight per Lineal Foot. Lbs.
$\frac{3}{4}$ -inch -----	.970
$\frac{7}{8}$ -inch -----	1.320
1 -inch -----	1.725
$1\frac{1}{8}$ inches -----	2.633
$1\frac{1}{4}$ inches -----	3.459
$1\frac{3}{8}$ inches -----	4.151
$1\frac{1}{2}$ inches -----	4.684
$1\frac{3}{4}$ inches -----	5.062
2 inches -----	5.812
$2\frac{1}{4}$ inches -----	7.977
$2\frac{1}{2}$ inches -----	9.828

Channeler Bar Steel

Per lb.

Halcomb Extra Warranted

Halcomb Standard

For extra hard rock work.

Miscellaneous

We also supply in Crucible Grades only—
Coal Auger and Pick Steel, Hammer and Sledge
Steel, Wedge, Flogging Chisel and Well-Bit
Steel.

Halcomb Steel Company

Alloy Steels

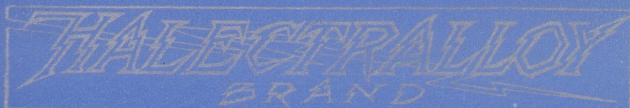
for

Motor Cars
Special Engineering and
Machine Purposes

Halcomb Steel Company

Electric Alloy Steels

The Halcomb Steel Company is the Pioneer manufacturer in the United States of Electric Furnace Alloy Steels; the Héroult Process is used. These Alloys, which may be of any analysis desired, possess so many inherent virtues due to the process and apart from their analysis, that they are described and known as our



The copyrighted name at once suggests the company, the process and the general type of steel. These products are admitted to be the best alloy products on the American market and in the few years they have been in use, particularly for automobile construction, have come into great demand and are accepted by the trade and by our competitors as well, as the Standard of Excellence with which all other steels are compared when Quality is the first consideration. The inherent merit of the Hal-electralloy Brand is due to several factors. The Héroult Electric Process produces steels of greater Chemical purity than any other method. Sulphur and Phosphorus below 0.01% is usual and above 0.02% is almost unknown. The

Harcourt Steel Company

process eliminates gases and perfectly deoxidizes the steel so that even in the lowest carbons it pours as quietly as the best melted high carbon tool steels. Slag and solid metallic impurities are absent. The ingots are of small size and hence radial and axial segregation is practically absent, and even if segregation of sulphur and phosphorus took place, these elements are so low that in the segregated portions they could scarcely reach the amounts permissible in accordance with the specifications which are given later. The Héroult process permits of less variation in alloying constituents than is possible by any other process and even the percentages of easily oxidizable metals like chromium and vanadium, so difficult to handle by the open hearth process, are controlled with great accuracy. Having produced steel thoroughly deoxidized, chemically of greatest purity, free from slag and segregation, the subsequent operations in the making of our product are those of refinement usual in "tool steel" or "quality" mills and materially different from those of the tonnage plants, where adequate care in heating, forging, and inspection are well nigh impossible.

In the operation of the Héroult Process we start with molten open hearth steel as our "raw" material. That is, we begin where others leave off. The material we charge into our electric furnace is just as good open hearth steel as can be made but it is not good enough,

Halcomb Steel Company

so we put on the finishing touches in the electric furnace; removing sulphur, gases, oxides and slag, and at the same time adjust the composition with accuracy and precision. These are the things that *make* quality.

Much open-hearth steel is of good quality as measured by ordinary analysis and tests, but it is the uncertainty,—the mysterious failure of parts made from heats that have passed the usual inspection and tests, that creates a demand for a superior product that can best be filled by the use of Halectralloy Brands.

FIRST COST VS. ULTIMATE COST

Obviously the cost of electric steel manufacture must be higher than that of open-hearth steel but it is lower than that of crucible steel. In quality it is equal to crucible steels and in many ways superior, besides being a commercial possibility for many uses where crucible steel is out of the question owing to its greater cost. The apparent cost of Halectralloy Steels, as compared with similar products of open-hearth make is unquestionably offset by their superior qualities. A higher percentage of perfect parts can be made from a given quantity of our electric steels than can be produced from the same quantity of open hearth steel because they forge so much better and also harden better. They stand more heat in forging,—in fact are almost indestructible in the fire. They possess wider safe ranges of hardening temper-

Halcomb Steel Company

ature and their freedom from pipe, seams and segregation makes them absolutely economical even at considerably higher first cost, and when we consider consequential damages, due to loss of time and service of the finished machine or loss of life or limb, due to failure of vital parts, there is left no doubt as to the moral obligation to use Haelectralloy Brands for exacting requirements.

Safety in service should be the first object sought, and when this is duly considered it will be found better to purchase our electrically melted alloys of inexpensive metals like manganese, chromium and silicon than spend money for expensive alloys such as nickel, tungsten and vanadium, melted by a cheaper and inferior process. After all it is not so important to secure extremely high elastic limits as it is to guard against the possibility of failures and consequential damages due to internal defects, unseen and unrevealed by ordinary methods of test and inspection.

SERVICE DEPARTMENT

We are prepared, upon request, to furnish expert advice in reference to the choice of material that should be used in Automobile Construction in every vital part. We are pleased to co-operate fully with customers desiring the best Alloys for every purpose. Let us study

Halcomb Steel Company

your construction. We will save you the expense of needlessly good material in non-essential parts, and recommend just the right thing for essential parts.

No ALLOY STEEL is a universal steel. It must be selected with fine discrimination, giving due thought to the duty it must perform. Feeling that we are more intimately acquainted with our various Electric Furnace Alloy Products than our customers can be, both as regards their analysis, mechanical qualities and thermal treatment, we willingly place our years of scientific and practical experience with Electric Furnace Alloys at the service of our patrons.

In the making of HALECTRALLOY Brands, quality, rather than tonnage, is our first desire. Each product must be the best of its kind. It must be uniform in composition year in and year out; it must be physically sound, free from pipes and seams, and pass rigid inspection; it must be uniform in physical condition and machining qualities. In short, our Electric Furnace Alloy Steels are handled with all the carefulness and minute attention to details affecting quality that characterize our High Grade Tool Steels.

HEAT TREATMENT DEPARTMENT

We have installed a modern, up-to-date department for the heat treatment of alloy steels. The equipment consists of five anneal-

Halcomb Steel Company

ing furnaces for bars, blocks, discs, etc., and seven oil-fired furnaces with necessary quenching facilities, either oil or water, to handle a large tonnage of alloy steels. The temperatures of all furnaces are measured by platinum, platinum-rhodium thermo-couples, also by radiation pyrometers, all of which are calibrated at frequent intervals. Our heat-treated alloys can be furnished to show any desired physical tests and ready for use without further treatment. The services of skilled metallurgists are employed to direct this work. A specialty is AXLE and SHAFT Steel, showing from 100,000 to 125,000 pounds elastic limit, yet readily machinable.

This department can handle anything from the smallest parts up to bars twelve feet long by ten or twelve inches in diameter, such as large axles and shafts, hydraulic rams, etc.

We also have excellent facilities for pickling, chipping and rough turning; and for hardness, tensile, transverse, vibratory, magnetic and microscopic testing.

This is perhaps the most generally used of the Alloys. This company manufactures a 3½% NICKEL Steel which in its machining qualities, uniformity of composition, hardening and tempering properties, has no equal, and is fully equivalent to the best open hearth 5% Nickel Steels. The lower carbons case harden readily and are admirable material for Gears, Rollers and Chain Rivets; while the high carbons are used extensively for Transmission and Drive Shafts, Cap Screws, Axles, etc. Other percentages of NICKEL can be furnished although seldom necessary or desirable. Below is given a table showing the physical properties which may be developed in this steel by various methods of heat treatment.

C%	E. L.	M. S.	ELON.	RED.	B. H.	REMARKS	**
.20	57,500	82,000	30	65	143	Annealed.	
	140,000	178,000	14	60	330	1600°-Oil - 600°F.	
	155,000	194,000	13.5	59.5	334	1600°-W.*- 600°F.	
.30	63,000	93,500	27	63	163	Annealed	
	187,000	215,000	13	57.5	405	1550°-Oil - 600°F.	
	189,000	217,000	12.5	57	406	1550°-W.*- 600°F.	
	97,000	102,000	19.5	59.6	208	Cold drawn.	
.40	65,000	94,000	27	57.3	168	Annealed.	
	101,000	115,000	24	66.9	225	1550°-Oil -1200°F.	

Tensile Tests made from test pieces machined and ground to standard tensile test piece adopted by International Association for Testing Material.

1600°-Oil-600°F. means: quenched from 1600°F. into oil and drawn at 600°F. for thirty minutes.

**—E. L. means Elastic Limit in pounds per square inch.

M. S. means Maximum Strength in pounds per sq. in.

Elon. means Elongation in 2 inches.

Red. means Reduction of area in per cent.

B. H. means Brinell Hardness.

* W. means quenched into water.

Harcourt Steel Company

Chrome Vanadium Steels

These Alloys are, in general, made of a High Carbon Type, suitable for oil-hardening for Springs and Constant Mesh Gears, and in Low Carbon Types for case-hardening work, or to be used oil-tempered and annealed for such requirements as Clash Gears, Axles, Steering Knuckles, etc. By the proper blending of these alloying metals and adjustment of the Carbon, one can not only obtain every static property that can be obtained from Nickel, Chrome-Nickel, Silicon-Manganese, or other Alloys, but also obtain wonderfully enhanced dynamic or anti-fatigue qualities. In general, when a better material than Nickel Steel is needed, especially when dynamic excellence is sought, we unreservedly commend our Electric Chrome Vanadium Steels. Our Chrome Vanadium Spring Steel is unequalled. These Alloys machine and forge easily, and are superior in these regards to the Chrome-Nickel Steels of corresponding Carbon percentages.

C%	E. L.	M. S.	ELON.	RED.	B. H.	REMARKS	**
.20	40,000	75,000	36	69	150	Annealed	
	145,000	185,000	12	55	390	1700°-Oil - 600°F.	
	180,000	200,000	12	51.5	385	1700°-W.*- 600°F.	
.30	45,000	80,000	35	69.2	155	Annealed	
	200,000	243,000	10.5	51.9	429	1700°-Oil - 600°F.	
	205,000	246,000	10	50.5	429	1700°-W.*- 600°F.	
	120,000	128,000	15	62.2	253	Cold Drawn	
.40	50,000	83,000	34	68	158	Annealed	
	200,000	221,000	11	48	435	1700°-Oil - 800°F.	
	120,000	148,000	20	53	270	1700°-Oil -1250°F.	
.50	52,000	86,000	30.5	67.7	163	Annealed	
	220,000	245,000	8.5	30	440	1700°-Oil - 800°F.	
	150,000	171,000	17	54	280	1700°-Oil -1250°F.	

** For meanings of abbreviations see page 53.

Chrome Nickel Steels

These steels are the static equals of Chrome Vanadium steels but are inferior to those steels in dynamic properties, in resistance to fatigue, in ease of heat treatment, and in ease of machining. The Chrome-Nickel steels possess the advantage of hardening at low temperatures which is of considerable value when warping must be prevented in intricate parts. However, where the standard is Chrome-Nickel, Halcomb Electric Furnace Chrome Nickel will far surpass the crucible or open-hearth products. Especially recommended for oil-tempered gears.

C%	E. L.	M. S.	ELON.	RED.	B. H.	REMARKS	**
.20	55,000	86,000	39.5	69.2	170	Annealed	
	170,000	210,000	13.5	51	400	1525°-Oil - 400°F.	
.40	60,000	90,000	29.5	66.9	175	Annealed	
	230,000	280,000	9.5	35	490	1525°-Oil - 400°F.	
	150,000	170,000	16.5	57.3	325	1525°-Oil -1000°F.	
.50	62,000	97,000	25	54.6	180	Annealed	
	215,000	216,000	8	37	446	1525°-Oil - 600°F.	
	240,000	290,000	6	33	495	1525°-Oil - 400°F.	

** For meanings of abbreviations see page 53.

Halcomb Steel Company

Silico-Manganese Steel

This type of steel has had great popularity abroad for springs, valve stems, gears and shafts. It is produced for either oil or water tempering. It stands a very high forging heat but requires a rather high heat for tempering. Dynamically this steel is second only to Chrome Vanadium, and is less expensive than the preceding alloys.

C%	E. L.	M. S.	ELON.	RED.	B. H.	REMARKS	**
.35	194,000	219,000	13	57	397	1750°-W.*- 800°F.	
	117,000	138,000	21	59	264	1750°-W.*-1200°F.	
.50	219,000	248,000	8	28	450	1750°-Oil - 800°F.	
	231,000	255,000	10	44	458	1700°-W.*- 800°F.	

Chrome-Silicon Steel

The Halcomb Steel Company manufactures an admirable product in its "C. S. M." Steel. It is supplied for either case-hardening or for oil-tempering, and has been distinctly popular for Springs, Axles, Shafts and Gears, where a better product than open hearth alloys was desired and our more expensive grades could not be employed. It is similar to Chrome-Nickel in regard to its low hardening heat in oil and freedom from warping.

C%	E. L.	M. S.	ELON.	RED.	B. H.	REMARKS	**
.15	50,000	83,000	28	60	152	Annealed.	
	70,000	112,000	21	67	207	1600°-Oil - 600°F.	
	125,000	155,000	12	59	347	1600°-W.*- 600°F.	
.30	95,000	110,000	25	68	219	1600°-Oil -1200°F.	
	180,000	215,000	11	44	423	1600°-Oil - 600°F.	
.40	199,000	220,000	12	48	434	1600°-Oil - 800°F.	
	110,000	125,000	20	52	269	1600°-Oil -1200°F.	

** For meanings of abbreviations see page 53.

Condensed Specifications for Automobile Steel

Recommended by the Society of Automobile Engineers and American Society for Testing Materials

Carbon as desired.

Grade of Steel	Permissible Range	Manganese	Phosphorus not over	Sulphur not over	Nickel	Chromium	Vanadium not under	Silicon
Ni.-----	.10	.50-.80	.04	.04	3.25-3.75	-----	---	---
Ni.-V.----	.10	.50-.80	.04	.04	3.25-3.75	-----	.12	---
Cr.-Ni.-----	.10	.50-.80	.04	.04	1.00-1.50	0.30-0.75	---	---
Cr.-Ni.-----	.10	.30-.60	.04	.04	1.50-2.00	0.75-1.25	---	---
Cr.-Ni.-----	.10	.30-.60	.04	.04	3.25-3.75	1.25-1.75	---	---
Cr.-Ni.-V.-	.10	.50-.80	.04	.04	1.00-1.50	0.30-0.75	.12	---
Cr.-Ni.-V.-	.10	.30-.60	.04	.04	1.50-2.00	0.75-1.25	.12	---
Cr.-----	.15	.20-.45	.03	.03	-----	0.90-1.10	---	---
Cr.-----	.15	.20-.45	.03	.03	-----	1.10-1.30	---	---
Cr.-V.-----	.10	.50-.80	.04	.04	-----	0.70-1.10	.12	---
Si.-Mn.---	.10	.50-.80	.04	.04	-----	-----	---	1.50-2.00

ABBREVIATIONS—Ni. for Nickel; V. for Vanadium; Cr. for Chromium; Si. for Silicon; Mn. for Manganese.

IMPORTANT NOTICE—Any of these Steels may be furnished in the "Haletralloys" Brands, but we can guarantee one-half of these maximum percentages in Sulphur and Phosphorus, and when necessary keep all other constituents within much narrower limits of variation.

Halcomb Steel Company

Cold Drawn
and Cold Rolled
Products

Cold Drawn and Cold Rolled Steel

We are prepared to furnish Cold Drawn Steel, from .007 inch to 3 inches diameter, in Rounds, and corresponding sizes in Squares, Flats and Special Shapes exact to size. (For price, see Special List.) Our specialties include Watch Part Steel, Valve Spring Wire, Needle Wire, Automobile Axle, Shaft and Cap Screw Steel, Nail Set, Band Saws, Dental Tools, Twist Drills and Taps, Ball Steel for turned or upset balls.

**Our Polished and Unpolished Drill Rods
are made in Extra Warranted Quality.**

Halcomb Steel Company

Halcomb Round Polished Drill Rods

For Taps, Reamers, Punches, Twist Drills, Dental Tools,
Watch Parts, Electrical Work, Etc.

Regular Lengths, 1 foot and 3 feet.

Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound	Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound
	1.500	1 $\frac{1}{2}$	\$0.50		1.031	1 $\frac{1}{32}$	\$0.50
	1.4843	1 $\frac{31}{64}$	.50		1.015	1 $\frac{1}{64}$	.50
	1.4687	1 $\frac{15}{32}$	.50		1.	1	.50
	1.4531	1 $\frac{29}{64}$	.50		0.984	$\frac{63}{64}$	.50
	1.4375	1 $\frac{7}{16}$	.50		0.969	$\frac{31}{32}$	.50
	1.4218	1 $\frac{27}{64}$	.50		0.953	$\frac{61}{64}$	.50
	1.4062	1 $\frac{13}{32}$	.50		0.937	1 $\frac{5}{16}$	.50
	1.3906	1 $\frac{25}{64}$	.50		0.921	$\frac{59}{64}$	.50
	1.375	1 $\frac{3}{8}$	.50		0.906	$\frac{29}{32}$	.50
	1.3593	1 $\frac{23}{64}$	.50		0.890	$\frac{57}{64}$	.50
	1.3437	1 $\frac{11}{32}$	.50		0.875	$\frac{7}{8}$	.50
	1.3281	1 $\frac{21}{64}$	.50		0.859	$\frac{55}{64}$	.50
	1.3125	1 $\frac{5}{16}$	.50		0.844	$\frac{27}{32}$	.50
	1.2968	1 $\frac{19}{64}$	.50		0.828	$\frac{53}{64}$	.50
	1.2812	1 $\frac{9}{32}$	.50		0.812	$\frac{13}{16}$	.50
	1.2656	1 $\frac{17}{64}$	.50		0.796	$\frac{51}{64}$	.50
	1.250	1 $\frac{1}{4}$	.50		0.781	$\frac{25}{32}$	.50
	1.2343	1 $\frac{15}{64}$	.50		0.765	$\frac{49}{64}$	.50
	1.2187	1 $\frac{7}{32}$	.50		0.750	$\frac{3}{4}$	.55
	1.2031	1 $\frac{32}{64}$	.50		0.734	$\frac{47}{64}$	.55
	1.1875	1 $\frac{3}{16}$	.50		0.719	$\frac{23}{32}$	.55
	1.1718	1 $\frac{11}{64}$	.50		0.703	$\frac{45}{64}$	.55
	1.1562	1 $\frac{5}{32}$	.50		0.687	$\frac{11}{16}$	.55
	1.1406	1 $\frac{9}{64}$	.50		0.671	$\frac{43}{64}$	.55
	1.125	1 $\frac{1}{8}$	.50		0.656	$\frac{21}{32}$	.55
	1.1093	1 $\frac{7}{64}$	.50		0.640	$\frac{41}{64}$	.55
	1.093	1 $\frac{3}{32}$	.50		0.625	$\frac{5}{8}$	.55
	1.078	1 $\frac{5}{64}$	.50		0.609	$\frac{39}{64}$	.55
	1.062	1 $\frac{1}{16}$	.50		0.594	$\frac{19}{32}$	.55
	1.046	1 $\frac{3}{64}$	.50		0.578	$\frac{27}{64}$	.55

Discount :

Halcomb Steel Company

Halcomb Round Polished Drill Rods

For Taps, Reamers, Punches, Twist Drills, Dental Tools,
Watch Parts, Electrical Work, etc.

Regular Lengths, 1 and 3 feet

Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound	Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound
	0.562	$\frac{9}{16}$	\$0.55	N	0.302		\$0.75
	0.546	$\frac{35}{64}$	.55		0.297	$\frac{19}{64}$	.75
	0.531	$\frac{17}{32}$	.55	M	0.295		.75
	0.515	$\frac{33}{64}$	.55	L	0.290		.75
	0.500	$\frac{1}{2}$	.60	K	0.281	$\frac{9}{32}$	.75
	0.484	$\frac{31}{64}$	.60	J	0.277		.75
	0.469	$\frac{15}{32}$	.60	I	0.272		.75
	0.453	$\frac{29}{64}$	.60	H	0.266	$\frac{17}{64}$	.75
	0.437	$\frac{7}{16}$	.60	G	0.261		.75
	0.425		.75	F	0.257		.75
	0.421	$\frac{27}{64}$	.75	E	0.250	$\frac{1}{4}$	.75
Z	0.413		.75	D	0.246		.75
	0.406	$\frac{13}{32}$	.75	C	0.242		.75
Y	0.404		.75	B	0.238		.75
X	0.397		.75	A	0.234	$\frac{15}{64}$	.75
	0.391	$\frac{25}{64}$	.75	1	0.227		.75
W	0.386		.75	2	0.219	$\frac{7}{32}$	.75
V	0.377		.75	3	0.212		.75
	0.375	$\frac{3}{8}$	.75	4	0.207		.75
U	0.368		.75	5	0.204		.75
	0.359	$\frac{23}{64}$	.75		0.203	$\frac{13}{64}$	.75
T	0.358		.75	6	0.201		.75
S	0.348		.75	7	0.199		.75
	0.344	$\frac{11}{32}$	.75	8	0.197		.75
R	0.339		.75	9	0.194		.75
Q	0.332		.75	10	0.191		.75
	0.328	$\frac{21}{64}$	.75	11	0.188	$\frac{3}{16}$	.75
P	0.323		.75	12	0.185		.75
O	0.316		.75	13	0.182		.75
	0.312	$\frac{5}{16}$	.75	14	0.180		.75

Discount :

Halcomb Steel Company

Halcomb Round Polished Drill Rods

For Taps, Reamers, Punches, Twist Drills, Dental Tools,
Watch Parts, Electrical Work, Etc.

Regular Lengths, 1 foot and 3 feet.

Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound	Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound
15	0.178		\$0.75	41	0.095		\$1.05
16	0.175		.83		0.094	$\frac{3}{32}$	1.05
17	0.172	$\frac{11}{64}$	.83	42	0.092		1.05
18	0.168		.83	43	0.088		1.05
19	0.164		.83	44	0.085		1.05
20	0.161		.83	45	0.081		1.05
21	0.157		.83	46	0.079		1.05
	0.156	$\frac{5}{32}$	.83		0.078	$\frac{5}{64}$	1.05
22	0.155		.83	47	0.077		1.20
23	0.153		.83	48	0.075		1.20
24	0.151		.83	49	0.072		1.20
25	0.148		.83	50	0.069		1.20
26	0.146		.83	51	0.066		1.45
27	0.143		.83	52	0.063		1.45
	0.141	$\frac{9}{64}$	.83		0.0625	$\frac{1}{16}$	1.45
28	0.139		.83	53	0.058		1.45
29	0.134		.83	54	0.055		1.45
30	0.127		.83	55	0.050		1.80
	0.125	$\frac{1}{8}$	.83		0.0468	$\frac{3}{64}$	1.80
31	0.120		.90	56	0.045		1.80
32	0.115		.90	57	0.042		1.80
33	0.112		.90	58	0.041		2.10
34	0.110		.90	59	0.040		2.10
	0.109	$\frac{7}{64}$	.90	60	0.039		2.10
35	0.108		.90	61	0.038		2.40
36	0.106		.90	62	0.037		2.40
37	0.103		.90	63	0.036		2.70
38	0.101		.90	64	0.035		2.70
39	0.099		1.05	65	0.033		2.70
40	0.097		1.05	66	0.032		3.00

Discount:

Halcomb Steel Company

Halcomb Round Polished Drill Rods

For Taps, Reamers, Punches, Twist Drills, Dental Tools,
Watch Parts, Electrical Work, Etc.

Regular Lengths, 1 foot and 3 feet

Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound	Nos.	Sizes in Decimals of an In.	Nearest Sizes in Fractions of an In.	Prices per Pound
67	0.031	$\frac{1}{32}$	\$3.00	74	0.022	$\frac{1}{64}$	\$3.90
68	0.030		3.00	75	0.020		4.05
69	0.029		3.30	76	0.018		4.20
70	0.027		3.30	77	0.016		4.50
71	0.026		3.60	78	0.015		4.80
72	0.024		3.60	79	0.014		5.10
73	0.023		3.60	80	0.013		5.40

Discount :

Drill Rod Gauge.

Intermediate sizes to order in quantity not less than 50
lbs. of any one size.

Halcomb Square Polished Drill Rods

We carry in stock a limited number of sizes
of Square Polished Drill Rods which are sold at
a discount from the round polished drill rod list.
We also manufacture cold drawn square and flat
gear-key steel.

High Speed Polished Drill Rods

We draw all sizes of Polished Drill Rods in HALCOMB HIGH SPEED Tool Steel, also Cold Drawn and Cold Rolled Flats, Squares and Special Sections.

Straightening and Cutting Classification

Nos. 0 to 5	6 to 9	10 to 11	12 to 16	17 to 20
1	2	3	4	5 cts. per lb.

20 inches or longer, 50 per cent. off list ; 10 to 20 inches, 25 per cent. off list ; 5 to 10 inches, net list ; 3 to 5 inches, add 25 per cent. to list ; 1 to 3 inches, add 50 per cent. to list.

Halcomb Steel Company

Halcomb Needle Wire

FOR SEWING MACHINE. LATCH NEEDLES,
AWLS, ETC.

List Prices in Coils

Gauge No.	Decimals of an Inch	Price per lb.	Gauge No.	Decimals of an Inch	Price per lb.
1-11	-----	\$0.41	19 $\frac{3}{4}$	.037	\$0.65
12	.105	.44	20	.0355	.65
13	.0925	.47	20 $\frac{1}{2}$	.0335	.70
13 $\frac{1}{2}$	.087	.49	20 $\frac{3}{4}$	.0325	.70
14	.080	.49	21	.0315	.70
14 $\frac{1}{2}$	.076	.50	21 $\frac{1}{2}$	.030	.76
15	.072	.50	22	.029	.76
15 $\frac{1}{4}$	.069	.50	22 $\frac{1}{2}$	.028	.88
15 $\frac{1}{2}$	.068	.53	22 $\frac{3}{4}$	.027	.88
16	.064	.53	23	.026	.88
16 $\frac{1}{4}$	.0625	.53	23 $\frac{1}{2}$	.025	.97
16 $\frac{3}{8}$	.060	.53	23 $\frac{3}{4}$	.024	.97
16 $\frac{1}{2}$	.058	.56	24	.023	.97
16 $\frac{3}{4}$	.0565	.56	24 $\frac{1}{2}$	.022	1.05
17	.055	.56	25	.021	1.05
17 $\frac{1}{4}$	.054	.56	25 $\frac{1}{2}$	.020	1.20
17 $\frac{1}{2}$	.052	.59	26	.019	1.20
17 $\frac{3}{4}$	.050	.59	26 $\frac{1}{2}$	.018	1.40
18	.0475	.59	27	.017	1 40
18 $\frac{1}{8}$	.047	.59	27 $\frac{1}{2}$	.016	2.30
18 $\frac{1}{4}$	.046	.59	28	.015	2 30
18 $\frac{1}{2}$	.044	.62	29	.0145	2.65
18 $\frac{3}{4}$	.043	.62	30	.01325	3.60
19	.0415	.62	30 $\frac{1}{2}$	.012	5.40
19 $\frac{1}{2}$	.039	.65	31	.011	5.40
19 $\frac{5}{8}$	.0385	.65	32	.010	6.10

Discount:

Washburn & Moen Gauge.

Halcomb Steel Company

Halcomb Needle Wire

FOR HOSIERY SPRING NEEDLES

List Prices in Coils

Gauge No.	Decimals of an Inch	Price per lb.	Gauge No.	Decimals of an Inch	Price per lb.
1-11	-----	\$0.50	19 $\frac{3}{4}$	.037	\$0.78
12	.105	.53	20	.0355	.78
13	.0925	.57	20 $\frac{1}{2}$	.0335	.85
13 $\frac{1}{2}$	.087	.59	20 $\frac{3}{4}$	.0325	.85
14	.080	.59	21	.0315	.85
14 $\frac{1}{2}$	.076	.60	21 $\frac{1}{2}$	.030	.93
15	.072	.60	22	.029	.93
15 $\frac{1}{4}$	.069	.60	22 $\frac{1}{2}$	.028	1.00
15 $\frac{1}{2}$	.068	.64	22 $\frac{3}{4}$	.027	1.00
16	.064	.64	23	.026	1.00
16 $\frac{1}{4}$	.0625	.64	23 $\frac{1}{2}$	.025	1.08
16 $\frac{3}{8}$	.060	.64	23 $\frac{3}{4}$	.024	1.08
16 $\frac{1}{2}$	.058	.67	24	.023	1.08
16 $\frac{3}{4}$	.0565	.67	24 $\frac{1}{2}$	.022	1.19
17	.055	.67	25	.021	1.19
17 $\frac{1}{4}$	.054	.67	25 $\frac{1}{2}$	.020	1.29
17 $\frac{1}{2}$	.052	.71	26	.019	1.29
17 $\frac{3}{4}$	.050	.71	26 $\frac{1}{2}$	.018	1.46
18	.0475	.71	27	.017	1.46
18 $\frac{1}{8}$	.047	.71	27 $\frac{1}{2}$	.016	2.35
18 $\frac{1}{4}$	.046	.71	28	.015	2.35
18 $\frac{1}{2}$	.044	.75	29	.0145	2.70
18 $\frac{3}{4}$	.043	.75	30	.01325	3.60
19	.0415	.75	30 $\frac{1}{2}$	.012	5.40
19 $\frac{1}{2}$	.039	.78	31	.011	5.40
19 $\frac{5}{8}$	.0385	.78	32	.010	6.10

Discount :

Washburn & Moen Gauge.

Harcourt Steel Company

The Birmingham Wire Gauge

In Decimal and Fractional Parts of an Inch, and the Weight of One Square Foot of Sheet Steel of Each Thickness.

Gauge No.	Decimals of an Inch	Fractions of an Inch	Weight of 1 Square Foot in Pounds
00000	.50	$\frac{1}{2}$	20.32
-----	.4687	$\frac{15}{32}$	19.05
0000	.454	-----	18.46
-----	.4375	$\frac{7}{16}$	17.78
000	.425	-----	17.28
-----	.4062	$\frac{13}{32}$	16.51
00	.380	-----	15.45
-----	.375	$\frac{3}{8}$	15.24
-----	.3437	$\frac{11}{32}$	13.97
0	.340	-----	13.82
-----	.3125	$\frac{5}{16}$	12.70
1	.300	-----	12.20
-----	.296	$\frac{19}{64}$	12.07
2	.284	-----	11.55
-----	.281	$\frac{9}{32}$	11.43
-----	.265	$\frac{17}{64}$	10.80
3	.259	-----	10.53
-----	.250	$\frac{1}{4}$	10.16
4	.238	-----	9.68
-----	.234	$\frac{15}{64}$	9.53
5	.220	-----	8.95
-----	.2187	$\frac{7}{32}$	8.89
6	.203	$\frac{13}{64}$	8.26
-----	.1875	$\frac{3}{16}$	7.62
7	.180	-----	7.32
-----	.171	$\frac{11}{64}$	6.99
8	.165	-----	6.71
-----	.1562	$\frac{5}{32}$	6.35
9	.148	-----	6.09
-----	.140	$\frac{9}{64}$	5.72
10	.134	-----	5.45
-----	.125	$\frac{1}{8}$	5.08

Halcomb Steel Company

The Birmingham Wire Gauge

In Decimal and Fractional Parts of an Inch, and the Weight of One Square Foot of Sheet Steel of Each Thickness.

Gauge No.	Decimals of an Inch	Fractions of an Inch	Weight of 1 Square Foot in Pounds
11	.120	----	4.48
12	.109	$\frac{7}{64}$	4.44
13	.095	----	3.86
----	.0937	$\frac{3}{32}$	3.81
14	.083	----	3.37
----	.078	$\frac{5}{64}$	3.18
15	.072	----	2.93
16	.065	----	2.64
----	.0625	$\frac{1}{16}$	2.54
17	.058	----	2.36
18	.049	----	1.99
----	.046	$\frac{3}{64}$	1.91
19	.042	----	1.71
20	.035	----	1.42
21	.032	----	1.30
----	.0313	$\frac{1}{32}$	1.27
22	.028	----	1.14
23	.025	----	1.02
24	.022	----	.89
25	.020	----	.81
26	.018	----	.73
27	.016	----	.65
----	.0156	$\frac{1}{64}$	.64
28	.014	----	.57
29	.013	----	.53
30	.012	----	.49
31	.010	----	.41
32	.009	----	.37
33	.008	----	.33
34	.007	----	.28
35	.005	----	.20
36	.004	----	.16

Halconb Steel Company

Different Standards for Wire Gauge in Use in the United States

Dimensions of Sizes in Decimal Parts of an Inch

No. of Wire Gauge	American or Brown and Sharpe	Birmingham or Stubbs' Wire	Washburn and Moen	British Imperial	Polished Drill Rods or Stubbs' Steel Wire	United States Legal Standard for Plates	No. of Wire Gauge
000000	-----	---	-----	.464	---	.46875	000000
00000	-----	---	-----	.432	---	.4375	00000
0000	.46	.454	.3938	.400	---	.40625	0000
000	.40964	.425	.3625	.372	---	.375	000
00	.3648	.38	.3310	.348	---	.34375	00
0	.32486	.34	.3065	.324	---	.3125	0
1	.2893	.3	.2830	.300	.227	.28125	1
2	.25763	.284	.2625	.276	.219	.265625	2
3	.22942	.259	.2437	.252	.212	.25	3
4	.20431	.238	.2253	.232	.207	.234375	4
5	.18194	.22	.2070	.212	.204	.21875	5
6	.16202	.203	.1920	.192	.201	.203125	6
7	.14428	.18	.1770	.176	.199	.1875	7
8	.12849	.165	.1620	.160	.197	.171875	8
9	.11443	.148	.1483	.144	.194	.15625	9
10	.10189	.134	.1350	.128	.191	.140625	10
11	.090742	.12	.1205	.116	.188	.125	11
12	.080808	.109	.1055	.104	.185	.109375	12
13	.071961	.095	.0915	.092	.182	.09375	13
14	.064084	.083	.0800	.080	.180	.078125	14
15	.057068	.072	.0720	.072	.178	.0703125	15
16	.05082	.065	.0625	.064	.175	.0625	16
17	.045257	.058	.0540	.056	.172	.05625	17
18	.040303	.049	.0475	.048	.168	.05	18
19	.03589	.042	.0410	.040	.164	.04375	19
20	.031961	.035	.0348	.036	.161	.0375	20
21	.028462	.032	.03175	.032	.157	.034375	21
22	.025347	.028	.0286	.028	.155	.03125	22
23	.022571	.025	.0258	.024	.153	.028125	23
24	.0201	.022	.0230	.022	.151	.025	24
25	.0179	.02	.0204	.020	.148	.021875	25
26	.01594	.018	.0181	.018	.146	.01875	26

Halcomb Steel Company

Fractions of an Inch in Equivalent Decimals

For use in connection with Micrometer Calipers

Fractions of an Inch		Decimals of an Inch	Fractions of an Inch		Decimals of an Inch
$\frac{1}{64}$	=	.015625	$\frac{33}{64}$	=	.515625
$\frac{1}{32}$	=	.03125	$\frac{17}{32}$	=	.53125
$\frac{3}{64}$	=	.046875	$\frac{35}{64}$	=	.546875
$\frac{1}{16}$	=	.0625	$\frac{9}{16}$	=	.5625
$\frac{5}{64}$	=	.078125	$\frac{37}{64}$	=	.578125
$\frac{3}{32}$	=	.09375	$\frac{19}{32}$	=	.59375
$\frac{7}{64}$	=	.109375	$\frac{39}{64}$	=	.609375
$\frac{1}{8}$	=	.125	$\frac{5}{8}$	=	.625
$\frac{9}{64}$	=	.140625	$\frac{41}{64}$	=	.640625
$\frac{5}{32}$	=	.15625	$\frac{21}{32}$	=	.65625
$\frac{11}{64}$	=	.171875	$\frac{43}{64}$	=	.671875
$\frac{3}{16}$	=	.1875	$\frac{11}{16}$	=	.6875
$\frac{13}{64}$	=	.203125	$\frac{45}{64}$	=	.703125
$\frac{7}{32}$	=	.21875	$\frac{23}{32}$	=	.71875
$\frac{15}{64}$	=	.234375	$\frac{47}{64}$	=	.734375
$\frac{1}{4}$	=	.25	$\frac{3}{4}$	=	.75
$\frac{17}{64}$	=	.265625	$\frac{49}{64}$	=	.765625
$\frac{9}{32}$	=	.28125	$\frac{25}{32}$	=	.78125
$\frac{19}{64}$	=	.296875	$\frac{51}{64}$	=	.796875
$\frac{5}{16}$	=	.3125	$\frac{13}{16}$	=	.8125
$\frac{21}{64}$	=	.328125	$\frac{53}{64}$	=	.828125
$\frac{11}{32}$	=	.34375	$\frac{27}{32}$	=	.84375
$\frac{23}{64}$	=	.359375	$\frac{55}{64}$	=	.859375
$\frac{3}{8}$	=	.375	$\frac{7}{8}$	=	.875
$\frac{25}{64}$	=	.390625	$\frac{57}{64}$	=	.890625
$\frac{13}{32}$	=	.40625	$\frac{29}{32}$	=	.90625
$\frac{27}{64}$	=	.421875	$\frac{59}{64}$	=	.921875
$\frac{7}{16}$	=	.4375	$\frac{15}{16}$	=	.9375
$\frac{29}{64}$	=	.453125	$\frac{61}{64}$	=	.953125
$\frac{15}{32}$	=	.46875	$\frac{31}{32}$	=	.96875
$\frac{31}{64}$	=	.484375	$\frac{63}{64}$	=	.984375
$\frac{1}{2}$	=	.5			

Galcomb Steel Company

Weight of Bar Steel—Per Foot

Size	Round	Square	Octagon	Size	Round	Square	Octagon
$\frac{1}{16}$	.010	.013	.011	2	10.68	13.60	11.29
$\frac{1}{8}$	.042	.053	.044	$\frac{1}{16}$	11.36	14.46	12.00
$\frac{3}{16}$	.094	.119	.099	$\frac{1}{8}$	12.06	15.35	12.74
$\frac{1}{4}$	.167	.212	.176	$\frac{3}{16}$	12.78	16.27	13.50
$\frac{5}{16}$	.261	.333	.276	$\frac{1}{4}$	13.52	17.22	14.29
$\frac{3}{8}$	.375	.478	.397	$\frac{5}{16}$	14.28	18.19	15.10
$\frac{7}{16}$	.511	.651	.540	$\frac{3}{8}$	15.07	19.18	15.92
$\frac{1}{2}$	.667	.850	.706	$\frac{7}{16}$	15.86	20.20	16.77
$\frac{9}{16}$	.845	1.076	.893	$\frac{1}{2}$	16.69	21.25	17.64
$\frac{5}{8}$	1.043	1.328	1.102	$\frac{9}{16}$	17.53	22.33	18.53
$\frac{11}{16}$	1.262	1.608	1.335	$\frac{5}{8}$	18.40	23.43	19.45
$\frac{3}{4}$	1.502	1.913	1.588	$\frac{11}{16}$	19.29	24.56	20.38
$\frac{13}{16}$	1.763	2.245	1.863	$\frac{3}{4}$	20.20	25.00	20.75
$\frac{7}{8}$	2.044	2.603	2.161	$\frac{13}{16}$	21.12	26.90	22.33
$\frac{15}{16}$	2.347	2.989	2.481	$\frac{7}{8}$	22.07	28.10	23.32
				$\frac{15}{16}$	23.04	29.34	24.35
1	2.670	3.400	2.822	3	24.03	30.60	25.40
$\frac{1}{16}$	3.014	3.838	3.186	$\frac{1}{16}$	25.04	31.89	26.47
$\frac{1}{8}$	3.379	4.303	3.572	$\frac{1}{8}$	26.08	33.20	27.56
$\frac{3}{16}$	3.766	4.795	3.980	$\frac{3}{16}$	27.13	34.55	28.68
$\frac{1}{4}$	4.173	5.312	4.409	$\frac{1}{4}$	28.20	35.92	29.81
$\frac{5}{16}$	4.600	5.857	4.861	$\frac{5}{16}$	29.30	37.31	30.97
$\frac{3}{8}$	5.049	6.428	5.335	$\frac{3}{8}$	30.42	38.73	32.15
$\frac{7}{16}$	5.518	7.026	5.832	$\frac{7}{16}$	31.56	40.18	33.35
$\frac{1}{2}$	6.008	7.650	6.350	$\frac{1}{2}$	32.71	41.65	34.57
$\frac{9}{16}$	6.520	8.301	6.890	$\frac{9}{16}$	33.90	43.14	35.81
$\frac{5}{8}$	7.051	8.978	7.452	$\frac{5}{8}$	35.09	44.68	37.08
$\frac{11}{16}$	7.604	9.682	8.036	$\frac{11}{16}$	36.31	46.24	38.38
$\frac{3}{4}$	8.178	10.41	8.640	$\frac{3}{4}$	37.56	47.82	39.69
$\frac{13}{16}$	8.773	11.17	9.271	$\frac{13}{16}$	38.81	49.42	41.02
$\frac{7}{8}$	9.388	11.95	9.919	$\frac{7}{8}$	40.10	51.05	42.37
$\frac{15}{16}$	10.02	12.76	10.59				

Halconb Steel Company

Weight of Bar Steel—Per Foot

Size	Round	Square	Octagon	Size	Round	Square	Octagon
3 ¹⁵ / ₁₆	41.40	52.71	43.75	6	96.14	122.4	101.6
4	42.73	54.40	45.15	¹ / ₁₆	98.14	125.0	103.8
¹ / ₁₆	44.07	56.11	46.57	¹ / ₈	100.2	127.6	105.9
¹ / ₈	45.44	57.85	48.02	³ / ₁₆	102.2	130.2	108.1
³ / ₁₆	46.83	59.62	49.48	¹ / ₄	104.3	132.8	110.2
¹ / ₄	48.24	61.41	50.97	⁵ / ₁₆	106.4	135.5	112.47
⁵ / ₁₆	49.66	63.23	52.48	³ / ₈	108.5	138.2	114.7
³ / ₈	51.11	65.08	54.02	⁷ / ₁₆	110.7	140.9	116.9
⁷ / ₁₆	52.58	66.95	55.57	¹ / ₂	112.8	143.6	119.2
¹ / ₂	54.07	68.85	57.15	⁹ / ₁₆	114.9	146.5	121.6
⁹ / ₁₆	55.59	70.78	58.75	⁵ / ₈	117.2	149.2	123.8
⁵ / ₈	57.12	72.73	60.37	¹¹ / ₁₆	119.4	152.1	126.2
¹¹ / ₁₆	58.67	74.70	62.00	³ / ₄	121.7	154.9	128.6
³ / ₄	60.25	76.71	63.67	¹³ / ₁₆	123.9	157.8	131.0
¹³ / ₁₆	61.84	78.74	65.35	⁷ / ₈	126.2	160.8	133.5
⁷ / ₈	63.46	80.81	67.07	¹⁵ / ₁₆	128.5	163.6	135.8
¹⁵ / ₁₆	65.10	82.89	68.80	7	130.9	166.6	138.3
5	66.76	85.00	70.55	¹ / ₁₆	133.2	169.6	140.8
¹ / ₁₆	68.44	87.14	72.33	¹ / ₈	135.6	172.6	143.3
¹ / ₈	70.14	89.30	74.12	³ / ₁₆	137.9	175.6	145.7
³ / ₁₆	71.86	91.49	75.94	¹ / ₄	140.4	178.7	148.3
¹ / ₄	73.60	93.72	77.79	⁵ / ₁₆	142.8	181.8	150.8
⁵ / ₁₆	75.37	95.96	79.65	³ / ₈	145.3	184.9	153.5
³ / ₈	77.15	98.23	81.53	⁷ / ₁₆	147.7	188.1	156.1
⁷ / ₁₆	78.95	100.5	83.42	¹ / ₂	150.2	191.3	158.8
¹ / ₂	80.77	102.8	85.32	⁵ / ₈	155.2	197.7	164.2
⁹ / ₁₆	82.62	105.2	87.31	³ / ₄	160.3	204.2	169.5
⁵ / ₈	84.49	107.6	89.31	⁷ / ₈	165.6	210.8	175.0
¹¹ / ₁₆	86.38	110.0	91.30	8	171.0	217.6	180.6
³ / ₄	88.29	112.4	93.29	9	218.4	275.6	227.8
¹³ / ₁₆	90.22	114.9	95.37	10	267.2	340.0	282.4
⁷ / ₈	92.17	117.4	97.44	11	323.0	411.2	340.6
¹⁵ / ₁₆	94.14	119.9	99.52	12	384.4	489.6	405.8

Weight of Hexagon Steel—Per Foot

SIZE		Weight per foot Pounds	SIZE		Weight per foot Pounds
Inches	M. M.		Inches	M. M.	
1 $\frac{7}{8}$	48	10.32	1 $\frac{3}{16}$	20 $\frac{1}{2}$	1.91
1 $\frac{3}{4}$	44 $\frac{1}{2}$	9.00	$\frac{3}{4}$	19	1.66
1 $\frac{11}{16}$	43	8.37	$\frac{23}{32}$	18	1.52
1 $\frac{5}{8}$	41	7.76	1 $\frac{1}{16}$	17 $\frac{1}{2}$	1.40
1 $\frac{9}{16}$	40	7.17	$\frac{5}{8}$	16	1.15
1 $\frac{1}{2}$	38	6.62	1 $\frac{1}{32}$	15	1.10
1 $\frac{7}{16}$	36 $\frac{1}{2}$	6.07	$\frac{9}{16}$	14 $\frac{1}{2}$	.93
1 $\frac{3}{8}$	35	5.57	1 $\frac{1}{32}$	13 $\frac{1}{2}$	.82
1 $\frac{5}{16}$	33 $\frac{1}{2}$	5.07	$\frac{1}{2}$	13	.73
1 $\frac{1}{4}$	32	4.60	1 $\frac{5}{32}$	12	.64
1 $\frac{3}{16}$	30	4.15	$\frac{7}{16}$	11	.56
1 $\frac{1}{8}$	28 $\frac{1}{2}$	3.73	1 $\frac{13}{32}$	10 $\frac{1}{2}$	.50
1 $\frac{3}{32}$	28	3.52	$\frac{3}{8}$	9 $\frac{1}{2}$	.43
1 $\frac{1}{16}$	27	3.33	1 $\frac{11}{32}$	9	.36
1	25 $\frac{1}{2}$	2.94	$\frac{5}{16}$	8	.29
$\frac{15}{16}$	24	2.58	$\frac{9}{32}$	7	.23
$\frac{29}{32}$	23	2.40	$\frac{1}{4}$	6 $\frac{1}{2}$	.195
$\frac{7}{8}$	22 $\frac{1}{2}$	2.25			

Halcumb Steel Company

Weights of Flat Bar Steel—Per Foot

	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	2	2 1/4	2 1/2	2 3/4	3
1 1/8	1.060	1.381	1.594	1.859	.212	.2391	.2656	.292	.319	.346	.372	.425	.478	.531	.584	.638
1 3/8	.2125	.2656	.3188	.3720	.425	.4782	.5312	.585	.638	.692	.744	.850	.96	1.06	1.17	1.28
1 1/2	.319	.399	.478	.558	.638	.717	.797	.875	.957	1.04	1.15	1.28	1.44	1.59	1.75	1.91
1 1/4	.425	.531	.636	.743	.850	.957	1.06	1.17	1.28	1.38	1.49	1.70	1.92	2.12	2.34	2.55
1 5/8	.531	.664	.797	.929	1.06	1.20	1.33	1.46	1.59	1.73	1.86	2.12	2.39	2.65	2.92	3.19
1 3/4	.638	.797	.957	1.116	1.28	1.43	1.59	1.76	1.92	2.08	2.23	2.55	2.87	3.19	3.51	3.83
1 7/8	.744	.929	1.116	1.302	1.49	1.68	1.86	2.05	2.23	2.42	2.60	2.98	3.35	3.72	4.09	4.46
1 1/2	.850	1.06	1.275	1.487	1.70	1.92	2.12	2.34	2.55	2.72	2.98	3.40	3.83	4.25	4.67	5.10
1 5/8	.957	1.20	1.434	1.674	1.92	2.15	2.39	2.63	2.87	3.11	3.35	3.83	4.30	4.78	5.26	5.74
1 3/4	1.06	1.33	1.594	1.859	2.12	2.39	2.65	2.92	3.19	3.46	3.72	4.25	4.78	5.31	5.84	6.38
1 1/4	1.17	1.46	1.753	2.045	2.34	2.63	2.92	3.22	3.51	3.80	4.09	4.67	5.26	5.84	6.43	7.02
1 3/8	1.28	1.60	1.913	2.232	2.55	2.87	3.19	3.51	3.83	4.15	4.47	5.10	5.75	6.38	7.02	7.65
1 1/2	1.38	1.73	2.072	2.417	2.76	3.11	3.45	3.80	4.14	4.49	4.84	5.53	6.21	6.90	7.60	8.29
1 5/8	1.49	1.86	2.232	2.604	2.98	3.35	3.72	4.09	4.47	4.84	5.20	5.95	6.69	7.44	8.18	8.93
1 3/4	1.60	1.99	2.391	2.789	3.19	3.59	3.99	4.39	4.78	5.18	5.58	6.38	7.18	7.97	8.77	9.57
1 1/4	1.70	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.80	7.65	8.50	9.35	10.20
1 1/8	1.91	2.39	2.87	3.35	3.83	4.30	4.78	5.26	5.74	6.22	6.70	7.65	8.61	9.57	10.52	11.48
1 1/2	2.12	2.66	3.19	3.72	4.25	4.79	5.31	5.85	6.38	6.91	7.44	8.50	9.57	10.63	11.69	12.75
1 3/8	2.34	2.92	3.51	4.09	4.67	5.26	5.84	6.43	7.02	7.60	8.18	9.35	10.52	11.69	12.85	14.03
1 1/4	2.55	3.19	3.83	4.47	5.10	5.74	6.38	7.02	7.65	8.29	8.93	10.20	11.48	12.75	14.03	15.30
1 5/8	2.76	3.45	4.15	4.84	5.52	6.22	6.90	7.60	8.29	8.98	9.67	11.05	12.43	13.81	15.19	16.58
1 3/4	2.98	3.72	4.47	5.21	5.95	6.70	7.44	8.19	8.93	9.67	10.42	11.90	13.40	14.88	16.37	17.85
1 1/2	3.19	3.99	4.79	5.58	6.38	7.17	7.97	8.77	9.57	10.36	11.15	12.75	14.34	15.94	17.53	19.13
2	3.40	4.25	5.10	5.95	6.80	7.65	8.50	9.35	10.20	11.05	11.90	13.60	15.30	17.00	18.70	20.40

Halcumb Steel Company

Weights of Flat Bar Steel—Per Foot

	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	6 1/4	6 1/2	6 3/4	7
1 1/8	.691	.741	.80	.85	.90	.96	1.01	1.06	1.12	1.17	1.22	1.27	1.33	1.38	1.43	1.49
1 1/8	1.38	1.49	1.59	1.70	1.81	1.91	2.02	2.13	2.23	2.34	2.44	2.55	2.66	2.76	2.87	2.97
1 1/8	2.07	2.23	2.39	2.55	2.71	2.87	3.03	3.19	3.35	3.51	3.67	3.83	3.99	4.14	4.30	4.46
1 1/4	2.76	2.98	3.19	3.40	3.61	3.83	4.04	4.25	4.46	4.67	4.89	5.10	5.31	5.53	5.74	5.95
1 1/4	3.45	3.72	3.99	4.25	4.52	4.78	5.05	5.31	5.58	5.84	6.11	6.38	6.64	6.90	7.17	7.44
1 1/4	4.15	4.47	4.78	5.10	5.42	5.74	6.06	6.38	6.69	7.02	7.34	7.65	7.97	8.29	8.61	8.93
1 1/2	4.83	5.20	5.58	5.95	6.32	6.70	7.07	7.44	7.81	8.18	8.56	8.93	9.29	9.67	10.04	10.41
1 1/2	5.53	5.95	6.38	6.80	7.22	7.65	8.08	8.50	8.93	9.35	9.77	10.20	10.63	11.05	11.48	11.90
1 1/2	6.22	6.70	7.17	7.65	8.13	8.61	9.09	9.57	10.04	10.52	11.00	11.48	11.95	12.43	12.91	13.39
1 3/8	6.91	7.44	7.97	8.50	9.03	9.57	10.10	10.63	11.16	11.69	12.22	12.75	13.28	13.81	14.34	14.87
1 3/8	7.60	8.18	8.76	9.35	9.93	10.52	11.11	11.69	12.27	12.85	13.44	14.03	14.61	15.20	15.78	16.36
1 3/8	8.29	8.93	9.57	10.20	10.84	11.48	12.12	12.75	13.39	14.03	14.67	15.30	15.94	16.58	17.22	17.85
1 3/8	8.98	9.67	10.36	11.05	11.74	12.43	13.12	13.81	14.50	15.19	15.88	16.58	17.27	17.95	18.65	19.34
1 3/8	9.67	10.41	11.16	11.90	12.65	13.39	14.13	14.87	15.62	16.36	17.10	17.85	18.60	19.34	20.08	20.83
1 3/8	10.36	11.16	11.95	12.75	13.55	14.34	15.14	15.94	16.74	17.53	18.33	19.13	19.92	20.72	21.51	22.32
1 1/2	11.05	11.90	12.75	13.60	14.45	15.30	16.15	17.00	17.85	18.70	19.55	20.40	21.25	22.10	22.95	23.80
1 1/2	12.43	13.39	14.34	15.30	16.26	17.22	18.17	19.13	20.08	21.04	21.99	22.95	23.91	24.87	25.82	26.78
1 1/2	13.81	14.87	15.94	17.00	18.06	19.13	20.19	21.25	22.32	23.38	24.44	25.50	26.56	27.62	28.69	29.75
1 1/2	15.20	16.36	17.53	18.70	19.87	21.04	22.21	23.38	24.54	25.71	26.88	28.05	29.22	30.39	31.56	32.72
1 1/2	16.58	17.85	19.13	20.40	21.68	22.95	24.23	25.50	26.78	28.05	29.33	30.60	31.88	33.15	34.43	35.70
1 1/2	17.96	19.34	20.72	22.10	23.48	24.87	26.25	27.63	29.01	30.39	31.77	33.15	34.53	35.91	37.29	38.67
1 3/4	19.34	20.83	22.32	23.80	25.29	26.78	28.27	29.75	31.24	32.73	34.22	35.70	37.19	38.68	40.17	41.65
1 3/4	20.72	22.31	23.91	25.50	27.10	28.69	30.28	31.87	33.47	35.06	36.65	38.25	39.85	41.44	43.03	44.63
1 7/8	22.10	23.80	25.50	27.20	28.90	30.60	32.30	34.00	35.70	37.40	39.10	40.80	42.50	44.20	45.90	47.60

Galcumb Steel Company

Table of Decimal Equivalents of Millimeters and Fractions of Millimeters

$$\frac{1}{100} \text{ m/m} = .0003937 \text{ inch.}$$

m/m	Inches	m/m	Inches	m/m	Inches
$\frac{1}{50}$	.00079	$\frac{26}{500}$	.02047	2	.07874
$\frac{2}{50}$	.00157	$\frac{27}{500}$	.02126	3	.11811
$\frac{3}{50}$	.00236	$\frac{28}{500}$	.02205	4	.15748
$\frac{4}{50}$	.00315	$\frac{29}{500}$	.02283	5	.19685
$\frac{5}{50}$	.00394	$\frac{30}{500}$	.02362	6	.23622
$\frac{6}{50}$	.00472	$\frac{31}{500}$	.02441	7	.27559
$\frac{7}{50}$	.00551	$\frac{32}{500}$	.02520	8	.31496
$\frac{8}{50}$	.00630	$\frac{33}{500}$	.02598	9	.35433
$\frac{9}{50}$	.00709	$\frac{34}{500}$	.02677	10	.39370
$\frac{10}{50}$	.00787	$\frac{35}{500}$	.02756	11	.43307
$\frac{11}{50}$	.00866	$\frac{36}{500}$	.02835	12	.47244
$\frac{12}{50}$	.00945	$\frac{37}{500}$	.02913	13	.51181
$\frac{13}{50}$	.01024	$\frac{38}{500}$	.02992	14	.55118
$\frac{14}{50}$	.01102	$\frac{39}{500}$	.03071	15	.59055
$\frac{15}{50}$	.01181	$\frac{40}{500}$	.03150	16	.62992
$\frac{16}{50}$	.01260	$\frac{41}{500}$	.03228	17	.66929
$\frac{17}{50}$	.01339	$\frac{42}{500}$	.03307	18	.70866
$\frac{18}{50}$	.01417	$\frac{43}{500}$	.03386	19	.74803
$\frac{19}{50}$	.01496	$\frac{44}{500}$	.03465	20	.78740
$\frac{20}{50}$	.01575	$\frac{45}{500}$	.03543	21	.82677
$\frac{21}{50}$	.01654	$\frac{46}{500}$	.03622	22	.86614
$\frac{22}{50}$	.01732	$\frac{47}{500}$	.03701	23	.90551
$\frac{23}{50}$	.01811	$\frac{48}{500}$	.03780	24	.94488
$\frac{24}{50}$	.01890	$\frac{49}{500}$	.03858	25	.98425
$\frac{25}{50}$	.01969	1	.03937	26	1.02362

$$10 \text{ m/m} = 1 \text{ centimeter} = 0.3937 \text{ inches.}$$

$$10 \text{ cm.} = 1 \text{ decimeter} = 3.937 \text{ inches.}$$

$$10 \text{ dm.} = 1 \text{ meter} = 39.37 \text{ inches.}$$

$$25.4 \text{ m/m} = 1 \text{ English inch.}$$

Useful Information

To find the area of a circle, multiply the square of the diameter by .7854.

To find the area of an octagon, multiply the square of the diameter of the inscribed circle by .828.

To find the area of a hexagon, multiply the square of the diameter of the inscribed circle by .866.

The weight of one cubic foot of steel is approximately 490 pounds.

The weight of one cubic inch of steel is approximately .285 pound.

The specific gravity of steel is approximately 7.85, while that of grey cast-iron averages 7.22, and white iron, 7.65.

Steels of the high speed types are much heavier than ordinary tool steel. Thus while the specific gravity of ordinary tool steel is 7.85, that of high speed steels varies from 8.45 to 8.75, depending upon the percentage of chromium and tungsten present. In estimating weights of high speed bars, therefore, one must increase the weights as given in this book by from $7\frac{1}{2}$ to 11 per cent. In general, one may consider high speed steel as 10 per cent. heavier than tool steel.

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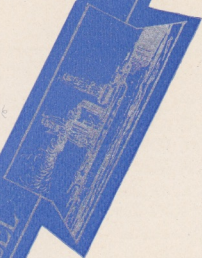
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**DREADNOUGHT**
HIGH SPEED STEEL



HALCOMB STEEL CO.
SYRACUSE, N.Y.



